

Appendix C
DESCRIPTION OF RESTUDY/COMPREHENSIVE
EVERGLADES RESTORATION PLAN
COMPONENTS

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OVERVIEW

This appendix provides a detailed description of the water resource development projects developed as part of the *Central and Southern Florida Project Comprehensive Review Study Final Integrated Feasibility Report and Programmatic Environmental Impact Statement* (Restudy) (USACE and SFWMD, 1999) and after intensive review have been incorporated into the *Lower East Coast Regional Water Supply Plan 2020* (LEC Plan) (See **Chapter 5** and **Chapter 6**). They will be implemented through the Comprehensive Everglades Restoration Plan (CERP).

Projects are presented within this appendix by geographic area (**Figure C-1**). These areas are as follows:

- Lake Okeechobee
- Lake Okeechobee Service Area
- Estuaries
- Everglades Agricultural Area
- North Palm Beach Service Area
- Lower East Coast Service Area 1
- Lower East Coast Service Area 2
- Lower East Coast Service Area 3
- Water Conservation Areas (WCAs) and Everglades National Park
- Bays
- Florida Keys
- Big Cypress Basin
- Systemwide

These components fall into one or more of the following categories:

- Operational Changes (**Figure C-2**)
- Aquifer Storage and Recovery (ASR) (**Figure C-3**)
- Surface Water Storage Reservoirs (**Figure C-4**)
- Stormwater Treatment Areas (STAs) (**Figure C-5**)
- Reuse of Reclaimed Water (**Figure C-6**)
- Removing of Barriers to Sheetflow (**Figure C-7**)
- Seepage Management (**Figure C-8**)
- Natural System Protection and Restoration (**Figure C-9**)
- Water Supply (**Figure C-10**)
- Water Quality (**Figure C-11**)

The components assigned to the last four categories, Seepage Management, Natural System Protection and Restoration, Water Supply, and Water Quality, are those that either do not fall into any of the first six categories or have at least one subproject within the component that does not fit into the first six categories. The first six categories may also provide seepage management, natural systems restoration and protection, water supply, and/or water quality benefits. The specific benefits provided by each component are discussed later in this appendix. **Figures C-2 through C-11** show the location of the components by category. Some components contain multiple projects which fall into different categories and, therefore, are on more than one map.

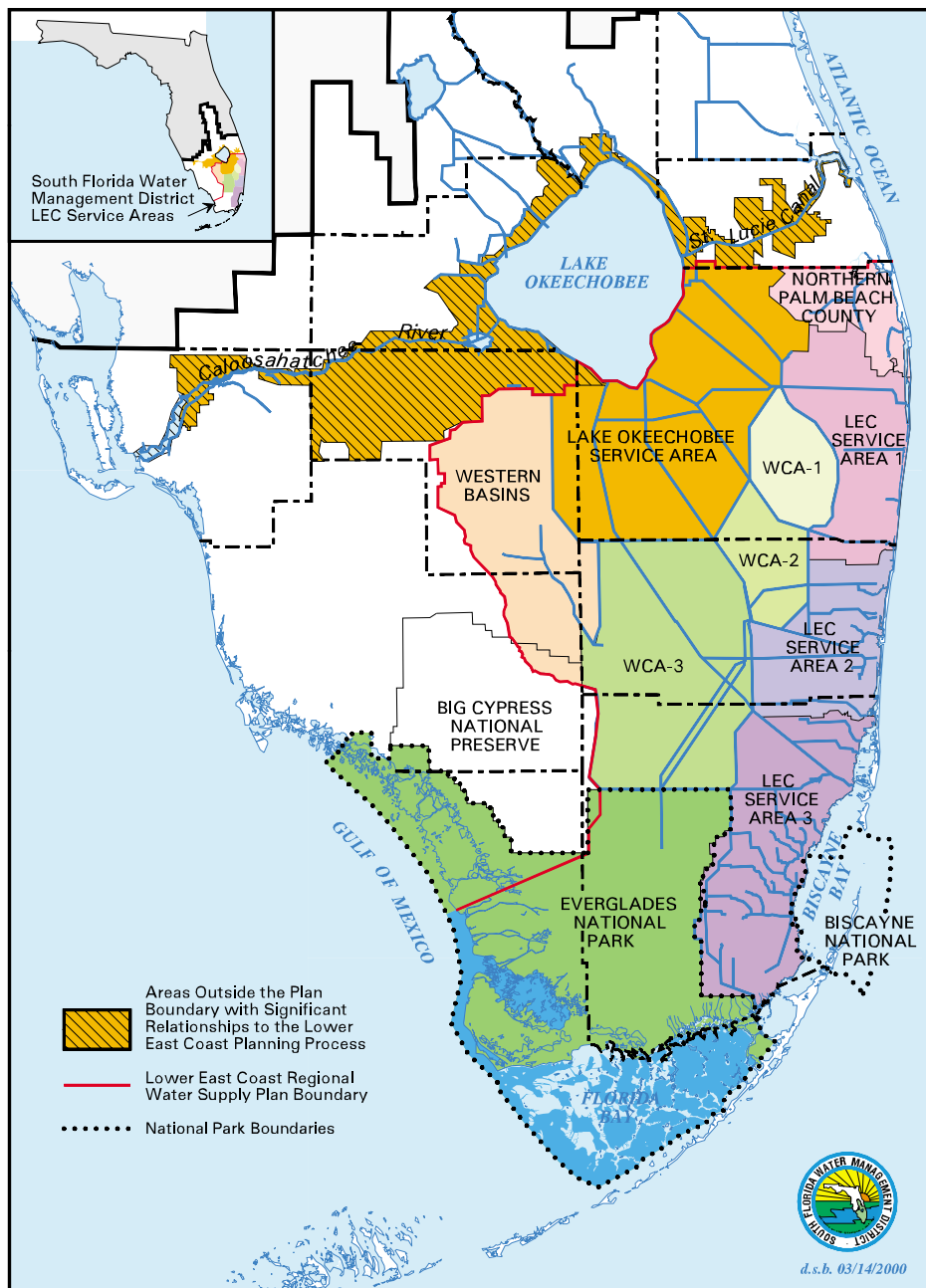


Figure C-1. Geographic Areas of the Lower East Coast Planning Area.

**Figure C-2.
Removed for Security Purposes**

**Figure C-3.
Removed for Security Purposes**

Figure C-4. Removed for Security Purposes

Figure C-5.
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**Figure C-6.
Removed for Security Purposes**

**Figure C-7.
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**Figure C-8.
Removed for Security Purposes**

**Figure C-9.
Removed for Security Purposes**

**Figure C-10.
Removed for Security Purposes**

**Figure C-11.
Removed for Security Purposes**

LAKE OKEECHOBEE

1. Lake Okeechobee Water Supply and Environmental Schedule

Restudy Component Letter: This component is the LEC Plan's recommended replacement for the Restudy's Lake Okeechobee Regulation Schedule component (F)

Geographic Region: Lake Okeechobee

Purpose: Operating criteria for Lake Okeechobee that includes flood control, water supply (including releases to the Water Conservation Areas (WCAs) to meet estimated natural system needs), and lake littoral zone and estuary protection.

Operation. The schedule was derived by integrating climate-based forecasts of inflows and tributary basin rainfall with the operating rules of the existing Lake Okeechobee schedule. This new Water Supply and Environmental (WSE) schedule meets water supply requirements as effectively as the current operational schedule. In addition, model simulations indicated that stress to the littoral zone was reduced, the number of discharge events that adversely impact the St. Lucie and Caloosahatchee estuaries decreased, and hydroperiods for the Everglades were enhanced.

The WSE schedule is based on the use of operational decision trees that determine when water should be discharged from Lake Okeechobee to the WCAs or the estuaries. In addition to evaluating water levels in the lake, the new features of this schedule give formal consideration to water conditions in tributary basins on a weekly basis and to multiseason climate outlooks on a monthly basis. Analyses of water conditions in the tributary basins are based on regional excess or deficit of net rainfall during the past four weeks, and average S-65E inflow for the past two weeks. Climate predictions are based on the official seasonal forecasts from the National Center of Environmental Predictions Climate Prediction Center (CPC) for wet season (May-October) and dry season (November-April) conditions.

Discharges to WCAs are discontinued if a particular WCA or any downstream WCAs are more than 0.25 feet above schedule. For WCA-2A, the maximum of the current drawdown schedule replaced the WCA-2A regulatory schedule. The WSE operational schedule illustrated the following favorable performance measure trends:

- The number of undesirable Lake Okeechobee water level events for the littoral zone were decreased by three.
- The Lake Okeechobee Service Area (LOSA) water supply needs being met during drought years was increased by four percent.
- Hydropattern matches to Natural System Model (NSM) simulations were improved in the WCAs.
- The number of times that high discharge criteria were exceeded for the estuaries was decreased.
- The number of days that lake stages were greater than 16.5 feet during the peak of the hurricane season (August 1-September 15) was reduced from 47 days in the base condition to six days with the WSE Operational Schedule.
- The maximum water level for this same critical period of the year was reduced from 17.46 feet in the base condition to 16.91 feet with the WSE operational guidelines.

In addition, the decision features of the WSE schedule have been incorporated into the analyses of future scenarios that were conducted for the Restudy and the LEC Plan.

Location: Lake Okeechobee (Figure C-2)

2. Lake Okeechobee Aquifer Storage and Recovery

Restudy Component Letter: GG

Geographic Region: Lake Okeechobee

Purpose:

- Provide additional regional storage while reducing both evapotranspiration losses and the amount of land removed from current land use (e.g. agriculture) that would normally be associated with construction and operation of aboveground storage facilities (reservoirs)
- Increase the lake's water storage capability to better meet regional water supply demands for agriculture, lower east coast urban areas, and the Everglades
- Manage a portion of regulatory releases from the lake primarily to improve Everglades hydropatterns, meet environmental targets within the WCAs, and meet the supplemental water supply demands of the lower east coast
- Reduce harmful regulatory discharges to the St. Lucie and Caloosahatchee estuaries
- Maintain the existing level of flood protection

Operation: Water from Lake Okeechobee is to be pumped into the Lake Okeechobee ASR wells when the climate-based inflow forecast projects that the lake water level will rise significantly above those levels that are desirable for the lake littoral zone (15.25 - 14.85 ft NGVD). During the dry season, flow may be made back to the lake from the ASR wells either when the lake water level is projected to fall to within three-quarters of a foot of the supply-side management line during the same dry season, or below 11.75 ft NGVD during the upcoming wet season. During the wet season, flow is allowed from the ASR wells to the lake when climate-based inflow forecast projects less than 1.5 million acre-feet (ac-ft) of inflow during the next six months, and the lake water level is either below 11.75 ft NGVD during the current wet season, or is projected to be in supply-side management during the upcoming dry season.

Design: 200 five-MGD ASR wells (1,000 MGD total) and associated infrastructure

Location: Lake Okeechobee peripheral levee (**Figure C-3**)

Assumptions and Related Considerations:

- Current United States Environmental Protection Agency (USEPA) and Florida Department of Environmental Protection (FDEP) regulations require that ASR source water meet primary drinking water standards before injection. Lake Okeechobee water is assumed to meet these standards.
- ASRs will have an approximate recovery rate of 70 percent, i.e. 30 percent of water injected to the deep wells is lost due to transmission (injection and recovery) and storage (mixing with deep aquifer saline water and migration of ASR storage flume) losses.

LAKE OKEECHOBEE SERVICE AREA

3. Lake Okeechobee Watershed Water Quality Treatment Facilities

Restudy Component Letter: OPE

Geographic Region: Lake Okeechobee Service Area

Purpose: To restore the hydrology of selected isolated and riverine wetlands in the region. A two-pronged approach will be taken to this project: 1) restoring hydrology of isolated wetlands by plugging the connection to drainage ditches; and 2) diversion of canal flows through constructed STAs to attenuate peak flows and retain phosphorus. The plugged drainage ditches will result in restoration of approximately 3,500 acres of wetlands throughout the Lake Okeechobee Watershed Basin.

Design:

- 1,755-acre facility in the S-154 Basin in Okeechobee County
- 2,600-acre facility in the S-65D Subbasin in the Kissimmee River Basin

Location: S-154 Basin and S-65D Subbasin of the Kissimmee River Basin (**Figures C-9 and C-11**)

Counties. Highlands and Okeechobee

4. North of Lake Okeechobee Storage Reservoir

Restudy Component Letter: A

Geographic Region: Lake Okeechobee Service Area

Purpose: To increase the capacity of the hydrologic system to better meet the water management objectives associated with flood protection, water supply, and environmental enhancement. The additional water storage capacity allows for greater detention of water during wet periods for subsequent use during dry periods. It is also anticipated that this increased storage capacity will shorten the duration and frequency of both high water levels in the lake that are stressful to the lake littoral ecosystems and large discharges from the lake that are disruptive to the downstream estuary ecosystems.

Operation: Water from Lake Okeechobee is to be pumped into the north storage reservoir when the climate-based inflow forecast projects that the lake water level will rise significantly above those levels that are desirable for the lake littoral zone (14.35-14.75 ft NGVD). During the dry season, flows will be allowed back into the lake from the reservoir when the lake level is projected to fall to within three-quarters of a foot of the supply-side management line in the same dry season, or below 11.75 ft NGVD in the upcoming wet season. During the wet season, flow is allowed from the reservoir to the lake when climate-based inflow forecast projects less than 1.5 million ac-ft of inflow to the lake during the next six months and the water level is either currently below 11.75 ft NGVD or projected to be in supply-side management during the upcoming dry season.

Design:

- 20,000 acres at 10-feet maximum depth
- Inflow pump capacity = 4,800 cubic feet per second (cfs)
- Outflow structure = 4,800 cfs

Location: To be determined – specific site not necessary for South Florida Water Management Model (SFWMM) simulation (**Figure C-4**)

Counties: Glades, Highlands, Okeechobee, Osceola, and Polk

Assumptions and related considerations:

- Land availability is uncertain
- An alternative to capturing lake water would be to attenuate flood waters before reaching the lake. This could be done north of the Kissimmee River which could have positive impacts to the Kissimmee River Restoration Project or within the Taylor Creek/Nubbin Slough which would improve water quality entering the lake.
- Stage duration of Lake Okeechobee have the potential to increase
- Maximum stages of Lake Okeechobee have the potential to decrease

5. C-44 Basin Storage Reservoir¹

Restudy Component Letter: B

Geographic Region: Lake Okeechobee Service Area

Purpose: Storage reservoir to capture local runoff from the C-44 Basin. The reservoir will be designed for flood flow attenuation to the estuary, water supply benefits including environmental water supply deliveries to the estuary, and water quality benefits to reduce salinity and nutrient impacts of runoff to the estuary.

Operation: Inflows from C-44 Basin runoff (and only when lake stage is greater than 14.5 ft NGVD)

Design:

- 10,000 acres at four-feet maximum depth
- Inflow pump capacity = to be determined (initially assumed to not constrain performance)
- Outflow structure capacity = to be determined (initially assumed to not constrain performance)

Location: To be determined – specific site not necessary for SFWMM simulation (**Figure C-4**)

Counties: Martin

Assumptions and related considerations:

- Uncertainty in land availability
- Potential water quality benefits by reducing nutrient loading to the estuary

1. Costs of this project are not included in **Table 93** in **Chapter 6** of the LEC Plan Planning Document. They will be included in the next update of the Upper East Coast Water Supply Plan.

6. C-43 Basin Storage Reservoir with Aquifer Storage and Recovery

Restudy Component Letter: D

Geographic Region: Lake Okeechobee Service Area

Purpose: Storage reservoir(s) with ASR to capture basin runoff and releases from Lake Okeechobee. These facilities will be designed for water supply benefits, some flood attenuation, and to provide environmental water supply deliveries to the Caloosahatchee Estuary.

Operation: Excess runoff from the C-43 Basin and Lake Okeechobee flood control discharges will be captured by the proposed C-43 Reservoir(s). Water from the reservoir(s) will be used to provide environmental deliveries to the Caloosahatchee Estuary, to meet demands in the Caloosahatchee Basin and to inject water into the ASR wellfield for long-term (multiseason) storage. Water from the ASR facilities will be used to meet environmental demand of the estuary and meet basin demands. Any estuarine demands not met by basin runoff, the reservoir, and the ASR system will be met by Lake Okeechobee, as long as lake stage is above 11.5 ft NGVD. Lake water is also used to meet the remaining basin demands subject to supply-side management.

The C-43 Reservoir is operated in conjunction with the Caloosahatchee Backpumping Facility which includes an STA for water quality treatment. If the levels of water in the reservoir exceed 6.5 feet and Lake Okeechobee is below the pulse release zone, then water is released and sent to the backpumping/treatment facility at 2000 cfs.

Design:

- Reservoir(s) total of 20,000 acres at eight-feet maximum depth.
- ASR wellfields total of 22 10-MGD wells
- Reservoir(s) Inflow pump capacity = to be determined (assumed not to constrain performance)
- ASR inflow capacity = limited to 220 MGD
- Reservoir(s) outflow structure capacity = to be determined (assumed not to constrain performance)
- ASR outflow capacity = limited to 220 MGD

Location: To be determined - specific site not necessary for simulations (**Figures C-3 and C-4**)

Counties: Hendry, Glades, and Lee

Assumptions and related considerations:

- Uncertainty in land availability
- Potential water quality benefits by reducing nutrient loadings
- Raw water ASR injection permittable
- 70 percent recovery for injected ASR water
- Size of injection bubble not limited
- ASR facility sized to slightly exceed minimum flows to estuary

7. L-8 Project

Restudy Component Letter: K

Geographic Region: Lake Okeechobee Service Area

Purpose: Reduce water supply restrictions in the Northern Palm Beach County Service Area by capturing more of the annual discharges from portions of the southern L-8, C-51, and C-17 basins and route this water to the West Palm Beach Water Catchment Area. Intent is to increase water supply availability and provide pass through flow to enhance hydroperiods in Loxahatchee Slough and increase base flows to the Northwest Fork of the Loxahatchee River.

Operation: Capture excess L-8, C-51, and C-17 basins water to meet urban water supply demands in the Northern Palm Beach County Service Area and enhance hydroperiods in the Loxahatchee Slough. Water would be diverted through the M Canal to the water catchment area. STAs will be provided to meet all water quality standards required if necessary.

Design:

- Added 48,000 ac-ft reservoir. The reservoir covers an area of approximately 1,200 acres and is located immediately west of the L-8 Canal and north of the C-51 Canal.
- Add 50-MGD ASR wells to provide water during regionally triggered droughts and as a means of reducing withdrawals from the West Palm Beach Water Catchment Area when the water levels are substantially below the target hydrograph. The majority or all of the 50 MGD ASR well clusters will be located in the vicinity of the city of West Palm Beach Water Treatment Plant (Clear Lake). However, for modeling purposes, the ASR wells will be located in the West Palm Beach Water Catchment Area. During periods when the West Palm Beach Water Catchment Area is above 18.0 ft NGVD, an additional (above the flow rate required to supply the water treatment plant) 50 MGD (78 cfs) will be sent to Lake Mangonia for subsequent storage through the ASR clusters (surficial well discharging into a Floridan well). The ASR wells will provide water directly to Lake Mangonia when water levels in the West Palm Beach Water Catchment Area are within 0.2 feet of the level that triggers regional supply to the West Palm Beach Water Catchment Area.
- Increase the pumping capacity from the L-8 Tieback into the M Canal to 300 cfs to increase the volume of water captured from the southern L-8 Canal and deliver it to the West Palm Beach Water Catchment Area. This pump has dual purposes: 1) to capture L-8 Basin runoff when available and 2) to deliver regional deliveries when needed.
- Assume that the Indian Trail Improvement District will adopt an operation plan which promotes water conservation by prioritizing discharge so that excess storm water is first offered to the West Palm Beach Water Catchment Area through installation of two pumps (300 cfs and 200 cfs) and secondarily discharged through off-peak releases to the C-51 Canal via the M-1 Canal. Pumping from Indian Trail Improvement District into the M Canal for subsequent discharge into the West Palm Beach Water Catchment Area will be assumed to occur under the following conditions:
 - When the City of West Palm Beach Water Catchment Area has sufficient need for imported water as defined by being below 18.2 ft NGVD.
 - When water levels in the lower M-1 Basin exceed 14.0 ft NGVD during the wet season (June 1-October 31) or 16.0 ft NGVD during the dry season (November 1-May 31) the lower M-1 Basin may discharge up to 200 cfs for subsequent storage.
 - When water levels in the upper M-1 Basin exceed 15.0 ft NGVD during the wet season or 16.0 ft NGVD during the dry season) the upper M-1 Basin may discharge up to 300 cfs for subsequent storage.
- Increase conveyance of the M Canal between the pump and the West Palm Beach Water Catchment Area to accommodate the increased inflow from the L-8 Canal and the Indian Trail Improvement District.
- Install a new structure in the south leg of C-18 just south of the west leg to facilitate better management of water levels and discharges from the Loxahatchee Slough. The new gravity structure would consist of a variable discharge up to 400 cfs and emergency overflow weirs.

- 50-cfs pump for water supply deliveries to utilities. A recharge canal may be improved to convey deliveries to utilities.
- STA(s) may be needed upstream of the water catchment area to attain acceptable water quality standards and to accommodate future degradation of water quality. The size and location of the STA(s) will be determined if treatment is required.
- New culverts under the Bee Line Highway for up to 100-cfs deliveries to the Loxahatchee Slough.
- Eliminate ASR component described in the Future Without Project Condition.

Location: Southern L-8 Basin including the Indian Trail Improvement District, West Palm Beach Water Catchment Area, and the Loxahatchee Slough (**Figures C-3, C-4, and C-5**)

Counties: Palm Beach

Assumptions and related considerations:

- This project should help maintain stages in the Loxahatchee Slough and reduce high discharges to the southwest fork of the Loxahatchee River.
- STA upstream of the West Palm Beach Water Catchment Area may be needed to accommodate future degradation of water quality.
- Secondary structures (recharge canals) may be needed downstream of the West Palm Beach Water Catchment Area to provide water to achieve the desired result.

8. Lake Okeechobee Tributary Sediment Dredging

Restudy Component Letter: OPE

Geographic Region: Lake Okeechobee Service Area

Purpose: Removal of phosphorous in canals located in areas of the most intense agricultural use in the Lake Okeechobee watershed. These sediments presently contribute to the excessive phosphorus loading to Lake Okeechobee.

Operation: Canals will be dredged and a partnership with local landowners will be pursued for the disposal of the dredged material on uplands. The South Florida Water Management District (District, SFWMD) has programmed a demonstration project to be implemented in 1999. Findings from this demonstration project will be used for detailed planning and design of this construction feature.

Design: This feature includes the dredging of sediments from 10 miles of primary canals within an eight-basin area in the northern watershed of Lake Okeechobee. The initial design assumes that the dredged material will contain approximately 150 tons of phosphorus.

Location: Northern watershed of Lake Okeechobee (**Figure C-11**)

Counties: Martin, Okeechobee, and Glades

Assumptions and related considerations: This feature is consistent with the water quality restoration goals for the lake included in the Lake Okeechobee Surface Water Improvement Management (SWIM) Plan and subsequently developed by the Lake Okeechobee Issue Team. Implementation of this feature will also complement other activities associated with pollution reduction for the lake.

9. Taylor Creek/Nubbin Slough Storage Reservoir and Stormwater Treatment Area

Restudy Component Letter: W

Geographic Region: Lake Okeechobee Service Area

Purpose: Storage reservoir to provide flood protection, water quality treatment, estuary protection, and water supply benefits.

Operation: Local runoff from the Taylor Creek/Nubbin Slough basins to be pumped into a 5,000-acre reservoir and then into a 5,000-acre STA. The STA will reduce phosphorus concentrations in the runoff from approximately 0.528 mg/L to 0.107 mg/L. Treated water will then be pumped into Lake Okeechobee when the lake stage is falling and is at least 0.5 feet below the bottom pulse release zone.

Design:

Storage Reservoir

- 5,000-acres at 10-feet maximum depth
- Inflow pump capacity = 2,500 cfs
- Outflow pump capacity = 1,000 cfs

Stormwater Treatment Area:

- 5,000-acres at four-feet maximum depth
- Inflow pump capacity = 1,000 cfs (same structure as reservoir outflow)
- Outflow pump capacity = 1,000 cfs

Location: North of Lake Okeechobee (**Figures C-4 and C-5**)

Counties: Okeechobee, St. Lucie

Assumptions and related considerations:

- Uncertainty in land availability
- Potential increase in stage duration of Lake Okeechobee
- Potential decrease in maximum stages of Lake Okeechobee.
- Phosphorus inflow concentrations (flow-weighted) for the Taylor Creek (S-191) and Nubbin Slough (S-133) basins obtained from five-year rolling averages (1991-1995)
- Average annual discharge rates determined from the period of record (1965-1990)

10. Caloosahatchee Backpumping with Stormwater Treatment Area

Restudy Component Letter: DDD

Geographic Region: Lake Okeechobee Service Area.

Purpose: Capture excess C-43 Basin runoff to augment the regional system. These facilities will be designed to backpump excess water from the C-43 Basin to Lake Okeechobee after treatment through a STA.

Operation: This component operates after estuary, agricultural, and urban demands have been met in the C-43 Basin and when water levels in the C-43 Storage Reservoir exceed 6.5 feet. When this situation occurs, water will be released from the reservoir and delivered to the STA at the capacity of the treatment system (2,000 cfs). The STA water is then backpumped to Lake Okeechobee. An additional requirement for the backpumping to take place is that Lake Okeechobee must be considered to have available storage, i.e. when its levels are below the pulse release zone line.

Design: The key components in the design are pumps and a STA. For the design it has been assumed that the STA is located adjacent to Lake Okeechobee. Because it is not known where the reservoir will be located relative to the STA, it has been assumed that water to be delivered to the STA will be released from the reservoir to the Caloosahatchee River and then pumped from the river into the STA. Since no pump to bring water from the lower basin (below the S-78 Structure) to the upper basin has been included in the reservoir design and since most of the basin runoff is generated in the lower basin, a pump to bring the water from the lower Caloosahatchee Basin to the upper basin has also been included. The STA has been included to meet the anticipated need to improve the quality of the water before it enters Lake Okeechobee. Finally, a pump station will be used to lift the water from the STA to Lake Okeechobee.

Pumps

- One 2,000-cfs capacity pump to take water from the lower Caloosahatchee Basin to the upper Caloosahatchee Basin
- One 2,000-cfs capacity pump to take water from the Caloosahatchee River into the STA
- One 2,000-cfs capacity pump to discharge water from the STA to Lake Okeechobee

Stormwater Treatment Area

- An STA of approximately 5,000 acres is proposed to achieve water quality improvements.

Location: To be determined - specific site not necessary for simulations (**Figure C-5**)

Counties: Hendry, Glades

Assumptions and related considerations:

- Land availability is uncertain.
- The component will provide water quality benefits to the lake.
- The Franklin Lock and Dam S-79 time series flow demand for the Caloosahatchee Estuary has been reduced.
- The performance measures were not changed.
- The model assumes that the backpumping/treatment facility, primarily the STA, functions as a flow-through system.

ESTUARIES

11. Environmental Water Supply Deliveries to the Caloosahatchee Estuary

Restudy Component Letter: E

Geographic Region: Estuaries

Purpose: To provide freshwater deliveries to the Caloosahatchee Estuary to establish desirable salinity regimes at locations of key estuarine biota

Operation: Deliver (revised) desired estuary target flow through S-79 in priority order, from basin runoff, from the C-43 Storage Reservoir, from the C-43 Basin ASR system and from Lake Okeechobee when the lake stage exceeds 15 ft NGVD

Design: (Operational changes only) The time series of estuary target flows was revised. The revised series changes the timing and total amounts in a way that assures that desirable salinity patterns will be achieved and at the same time makes some water available for capture and utilization in the regional system. The capture of the excess runoff is accomplished by the C-43 Basin Storage Reservoir(s) with ASR component (**Component 6**) and by Caloosahatchee Backpumping with STA component (**Component 10**).

Location: C-43 Basin and Caloosahatchee Estuary (**Figure C-2**)

Assumptions and related considerations:

- Estuary deliveries are made to maintain salinity conditions in the estuary that support a range of aquatic vegetation, seagrass, invertebrates, and fish communities.
-

12. Environmental Water Supply Deliveries to the St. Lucie Estuary

Restudy Component Letter: C

Geographic Region: Estuaries

Purpose: Environmental Water Supply Deliveries to the St. Lucie Estuary will provide freshwater deliveries to the St. Lucie Estuary to protect and restore more natural estuarine conditions. The target estuarine time series was revised because, under current policy, the C-44 Basin does not discharge water to the St. Lucie Estuary when Lake Okeechobee is below 14.5 ft NGVD and also because such discharges are generally undesirable from an estuarine management viewpoint.

Operation: Deliver revised estuary target discharge through S-80 from the reservoir when water is available or from the lake when the lake stage exceeds 11.5 ft NGVD

Design: Operational changes only

Location: C-44 Basin and St. Lucie Estuary (**Figure C-2**)

Counties: Martin and St. Lucie

Assumptions and related considerations: Estuary deliveries are based on maintaining salinity conditions in the estuary to support a range of aquatic vegetation seagrass, invertebrates, and fish communities.

13. C-23/C-24/Northfork and Southfork Storage Reservoirs¹

Restudy Component Letter: UU

Geographic Region: Lake Okeechobee Service Areas and Estuaries

Purpose: Storage reservoirs to capture local runoff from the C-23, C-24, Northfork, and Southfork basins of the St. Lucie River Estuary. The reservoirs will be designed for flood flow attenuation to the estuary; water supply benefits, including environmental water supply deliveries to the estuary; and water quality benefits to reduce salinity and nutrient impacts of runoff to the estuary. A reservoir is located within each basin.

Operation: Inflows from the C-23, C-24, Northfork, and Southfork basins of the St. Lucie River

Design:

- A total of 26,200 acres at eight-feet maximum depth distributed as follows among these basins:
 - The C-23 Basin will have a 8,400-acre reservoir.
 - The C-24 Basin will have a 6,000-acre reservoir.
 - The Northfork Basin will have a 11,800-acre reservoir.
 - The Southfork Basin will have a 9,350-acre, four-feet maximum depth reservoir.
- Inflow pump capacity = 1.0 to 1.5 inches per day
- Outflow structure capacity = to be determined (initially assumed to not constrain performance)

Location: To be determined – specific site not necessary for SFWMM simulation (**Figure C-4**)

Counties: Martin and St. Lucie

Assumptions and related considerations:

- Uncertainty in land availability
- Potential water quality benefits by reducing nutrient and sediment loading to the estuary

1. Costs of this project are not included in **Table 93** in **Chapter 6** of the LEC Plan Planning Document. They will be included in the next update of the Upper East Coast Water Supply Plan.

EVERGLADES AGRICULTURAL AREA

14. Everglades Agricultural Area Storage Reservoir

Restudy Component Letter: G

Geographic Region: Everglades Agricultural Area

Purpose: Storage reservoir improves timing of environmental deliveries to the WCAs including reducing damaging flood releases from the Everglades Agricultural Area (EAA) to the WCAs; reduces Lake Okeechobee regulatory releases to estuaries; meets supplemental agricultural irrigation demands; and increases flood protection within the EAA. Conveyance capacity of the Miami and North New River Canals between Lake Okeechobee and the storage reservoir(s) is increased to convey additional Lake Okeechobee flood control releases that would have otherwise been discharged to the Caloosahatchee and St. Lucie estuaries. Conveyance capacity of the Bolles and Cross canals between the Miami and Hillsboro canals is increased to facilitate interbasin transfers for storage and flood protection.

Operation: Inflows are from Lake Okeechobee regulatory discharges and runoff from Miami and North New River and canal basins. The reservoir will be divided into three compartments:

Compartment 1:

- 20,000 acres which meets EAA irrigation demands only.
- The source of water is excess EAA runoff. Inlet capacities for excess runoff are 2,700 and 2,300 cfs, for the Miami Canal and the North New River Canal basins, respectively.
- Outlet capacities for EAA demands are 3,000 and 4,400 cfs, for the Miami Canal and the North New River Canal basins, respectively.
- Overflow to Compartment 2A occurs when the depth of water approaches the six-foot maximum and Lake Okeechobee regulatory discharges are not occurring or impending.
- Excess EAA runoff is diverted to Compartment 2A only if WCA-3A is too deep.

Compartment 2A:

- 20,000 acres which meets environmental demands as a priority, but can supply a portion of EAA irrigation demands if environmental demands equal zero.
- The sources of water are overflow from Compartment 1 and Lake Okeechobee regulatory releases including the weather forecasting to initiate storage usage
- Compartment 2A will be operated as a dry storage reservoir and discharges made down to 18 inches below ground level.

Compartment 2B:

- 20,000-acres which meets environmental demands as a priority.
- The sources of water are overflow from Compartments 1 and 2A and Lake Okeechobee regulatory releases during extreme wet events.
- Compartment 2B will be operated as a dry storage reservoir and discharges made down to 18 inches below ground level.

The conveyance of the northern reaches of the Miami and North New River Canals in the EAA are tripled (200 percent increase) for Lake Okeechobee regulatory releases. Structures with a capacity of 4,500 cfs for diversion of regulatory releases through the Miami Canal and 3,000 cfs for diversion of regulatory releases through the North New River Canal are added to Compartments 2A and 2B. When the reservoir depth falls below 1.5 feet, Lake Okeechobee is used for meeting supplemental irrigation and environmental demands. The flows will be delivered to the WCAs through STA-3/4.

Design:

Compartment 1:

- 20,000-acre reservoir at six-feet maximum depth

- Inflow structure capacity: inflow pumps of 2,700 cfs for Miami Canal Basin and 2,300 cfs for North New River Canal Basin for diversion of EAA runoff
- Outflow structure capacity: one 3,000-cfs structure for the Miami Canal Basin and one 4,400-cfs structure for North New River and Hillsboro basins to EAA (initially assumed to not constrain performance)

Compartment 2A:

- One 20,000-acre reservoir at six-feet maximum depth
- Inflow structure capacity: Inflow pumps of 4,500 cfs and 3,000 cfs for diversion of Lake Okeechobee regulatory releases from the Miami and North New River canals, respectively
- Outflow structure capacity: 3,600 cfs at six-feet head to STA-3/4. Increase in Miami, North New River, Bolles, and Cross canal capacities is 200 percent. Outflows to Miami Canal and North New River Canal will be 4,500 cfs and 3,000 cfs, respectively.

Compartment 2B:

- One 20,000-acre reservoir at six-feet maximum depth.
- Inflow structure capacity: inflow pumps of 4,500 cfs and 3,000 cfs for diversion of Lake Okeechobee regulatory releases from the Miami and North New River canals, respectively.

Location: To be determined - conceptually located in Palm Beach County between the Miami and North New River canals for SFWMM simulation purposes only (**Figure C-4**)

Assumptions and related considerations:

- Land Availability
- Modifications to STAs if needed for Everglades water deliveries to meet the appropriate water quality

15. Revised Holey Land Wildlife Management Area Operation Plan

Restudy Component Letter: DD

Geographic Region: Everglades Agricultural Area

Purpose: Improve timing and location of water depths within the Holey Land Wildlife Management Area (WMA) based on rain-driven operations

Operation: Rain-driven modified operational rules with NSM-like hydrologic conditions triggering deliveries. Rain-driven inflows are driven by target water depths in cell R45C18. Outflows are based on target water depths in R42C20.

Design: Operational changes only

Location: Southern portion of the EAA, north of WCA-3A (**Figure C-2**)

Counties: Palm Beach

Assumptions and related considerations:

- Water deliveries made to the Holey Land WMA through G-200A or from STA-3/4 if Rotenberger WMA flows are insufficient. The deliveries are assumed to be of acceptable water quality from either the Rotenberger WMA or Lake Okeechobee through STA-3/4.

16. Modified Rotenberger Wildlife Management Area Operation Plan

Restudy Component Letter: EE

Geographic Region: Everglades Agricultural Area

Purpose: Improve timing and location of water depths within the Rotenberger WMA based on rain-driven operations.

Operation: Rain-driven operational rules with NSM-like hydrologic conditions triggering deliveries. Rain-driven inflows and outflows are driven by the average of target water depths in cells R46C15 and R43C16.

Design: Operational changes only

Location: Southern portion of the EAA, north of WCA-3A (**Figure C-2**)

Counties: Palm Beach

Assumptions and related considerations:

- Water deliveries made to the Rotenberger WMA from STA-5 are assumed to be of acceptable water quality.

NORTH PALM BEACH SERVICE AREA

17. C-17 Backpumping and Treatment

Restudy Component Letter: X

Geographic Region: North Palm Beach Service Area

Purpose: Reduce water supply restrictions in the Northern Palm Beach County Service Area by providing additional flows from the C-17 Basin to the West Palm Beach Water Catchment Area and enhance hydroperiods in the Loxahatchee Slough.

Operation: Capture excess C-17 Canal water to meet urban water supply demands in North Palm Beach Service Area. Water would be diverted through existing canals to a STA and ultimately to the West Palm Beach Water Catchment Area.

Design:

- 200-cfs pump in the existing Northern Palm Beach County Improvement District Canal at its intersection with the Turnpike Canal to pull flows west and direct them south into the east Turnpike Canal
- Culvert under Forty-Fifth Street (north-south) to connect the east Turnpike Canal
- 150-cfs capacity culvert and pump from the Turnpike Canal to direct flows into the proposed STA
- 550-acre STA at four-feet maximum depth
- 200-cfs culvert to connect STA under Florida's Turnpike to allow nonrestrictive flows
- 100-cfs gravity discharge structure into West Palm Beach Water Catchment Area

Location: 550 acres located east of the West Palm Beach Water Catchment Area (**Figures C-5 and C-10**)

Counties: Palm Beach

Assumptions and related considerations:

- Water quality of the C-17 Canal water similar to C-51 Canal water quality
- Location of STA south of existing landfill
- Improve conveyance in the Northern Palm Beach County Improvement District and Turnpike canals, as necessary, to pass flows

18. Pal-Mar and J.W. Corbett Wildlife Management Area Hydropattern Restoration

Restudy Component Letter: OPE

Geographic Region: Lake Okeechobee and North Palm Beach service areas

Purpose: The purpose of this feature is to provide hydrologic connections between the J.W. Corbett WMA and (1) the Moss Property, (2) the C-18 Canal, (3) the Indian Trail Improvement District, and (4) the L-8 Borrow Canal, in addition to extending the spatial extent of protected natural areas.

Operation: These connections would relieve the detrimental effects on native vegetation frequently experienced during the wet season and form an unbroken 126,000-acre greenbelt extending from the Dupuis Reserve near Lake Okeechobee across the J.W. Corbett WMA and south to Jonathan Dickinson State Park.

Design:

- Water control structures and canal modifications
- Acquisition of 3,000 acres located between Pal-Mar and the J.W. Corbett WMA

Location: East of Lake Okeechobee along State Road 710 (**Figures C-7 and C-9**)

Counties: Martin and Palm Beach

19. C-51 and Southern L-8 Reservoir

Restudy Component Letter: GGG

Geographic Region: Lower East Coast Service Area 1 and Lake Okeechobee Service Area

Purpose: Storage reservoir managed for the environmental and water supply goals listed below

- Reduce the number of events when discharges to the Lake Worth Lagoon exceed the desired daily average flow rate of 500 cfs
- Reduce the magnitude of events exceeding the desired flow rate of 500 cfs
- Reduce the average annual volume discharged to tide (over the S-155 Structure) by detaining storm water runoff for subsequent environmental needs (routing from the West Palm Beach Water Catchment Area to the northwest fork of the Loxahatchee River) and water supply needs (providing water to the Lake Worth Drainage District and the West Palm Beach Water Catchment Area).
- Provide increased drainage to the C-51 Basin and the Southern L-8 Basin by lowering the average stages in the C-51 Canal

Operation: The reservoir will be filled with excess water from the Southern L-8 Basin and the C-51 Basin when flows over the S-155 Structure exceed 300 cfs during the wet season from excess water in the C-51 Canal and Southern L-8 (backpumped) canals. Water will be released back to the C-51 Canal to help maintain canal stages during the dry season.

Design:

- 1,200 acres of usable area with a 100-foot deep, two-foot thick slurry wall for seepage control along the approximate perimeter length of six miles (this depth assumes a 170-foot surficial aquifer thickness, a 20-foot embankment, and 10 feet of embedment of the slurry into the confining layer). The reservoir will have a total storage depth of 40 feet (30 feet below grade and 10 feet above grade).
- Inflow pump capacity will be 1,500 cfs at the reservoir.
- Emergency outflow structure will have a capacity of 1,500 cfs for when the water level exceeds the maximum operation depth of 40 feet by two feet.
- Pumped outflow will have a maximum rate of 400 cfs at 40 feet and will use the discharge schedule shown in **Table C-1**.
- This component includes a 1,000-cfs pump at the S-155A Structure, which will be operated when flows through S-155 exceed 300 cfs, and there is capacity in the reservoir.

Table C-1. Discharge Schedule for the Pumped Outflow.

Depth (feet)	Discharge Rate (cfs)	Storage Volume (ac-ft)
42	1,500	50,400
41	415	49,200
40	400	48,000
30	300	36,000
20	300	24,000
10	300	12,000
0	300	0

Location: Immediately west of the L-8 Canal and north of the C-51 Canal (**Figure C-4**)

Counties: Palm Beach

Assumptions and related considerations:

- This parcel is owned by Palm Beach Aggregate and is currently an active mining operation with a nominal excavation depth of 40 feet.
- Slurry wall surrounding perimeter will be built to address seepage and water quality issues due to ancient or connate water with a chloride content of 500 mg/L.
- The component will include telemetry control and monitoring.

LOWER EAST COAST SERVICE AREA 1

20. Hillsboro (Site 1) Impoundment and Aquifer Storage and Recovery

Restudy Component Letter: M

Geographic Region: Lower East Coast Service Area 1

Purpose: Water supply storage reservoir to supplement water deliveries to the Hillsboro Canal during the dry season.

Operation: The reservoir will be filled during the wet season from excess water backpumped from the Hillsboro Canal. Water will be released back to the Hillsboro Canal to help maintain canal stages during the dry season. If water is not available in the reservoir, existing rules for water delivery to this region will be applied. ASR wells are being proposed to improve water supply during dry seasons and droughts. Thirty-five-MGD capacity ASR wells will be sited around the reservoir (total injection and recovery capacity is 150 MGD or about 230 cfs). Water from the Hillsboro Impoundment will be injected into the ASR wells when stages in the impoundment are greater than 12.0 ft NGVD (0.5 feet of depth). Water will be recovered from the ASR wells when stages in the Hillsboro Canal are less than seven ft NGVD.

Design:

- 2,460 acres with a maximum depth of six feet located north and south of the Hillsboro Canal. The portion of the canal that is located within the proposed reservoir will be incorporated into the reservoir.
- Inflow pump capacity is 700 cfs and is relocated to the eastern end of the Hillsboro Canal.
- Outflow structure capacity is 200 cfs at four feet of head.
- Emergency outflow structure is 700 cfs.
- Thirty five-MGD ASR wells (total capacity 150 MGD or about 230 cfs).

Location: See **Figures C-3** and **C-4**

Counties: Palm Beach

Assumptions and related considerations:

- If a treatment facility could be added to meet Everglades' water quality standards, excess storage could be discharged to WCA-2A
- The recovery rate for water stored by ASR is 70 percent.

21. Acme Basin B Discharge

Restudy Component Letter: OPE

Geographic Region: Lower East Coast Service Area 1

Purpose: Provide water quality treatment and storm water attenuation for runoff from Acme Basin “B” prior to discharge to the Arthur R. Marshall Loxahatchee National Wildlife Refuge (WCA-1) or alternative locations described below. Excess available water may be used to meet water supply demands in central and southern Palm Beach County.

Operation: If water quality treatment criteria is met, storm water runoff from Acme Basin B will be pumped into the wetland treatment area and then into the storage reservoir until such time as the water can be discharged into the Arthur R. Marshall Loxahatchee National Wildlife Refuge (WCA-1). If water quality treatment criteria is not met, storm water runoff will be pumped into one of two alternative locations: the Palm Beach County Agricultural Reserve Reservoir (**Component 27**) or the combination aboveground and in-ground reservoir area located adjacent to the L-8 Borrow Canal and north of the C-51 Canal.

Design: This feature includes the construction of a wetland or chemical treatment area and a storage reservoir with a combined storage capacity of 3,800 ac-ft. The initial design for the treatment area and reservoir assumed 310 acres with the water level fluctuating up to 4 feet above grade and 620 acres with the water level fluctuating up to 8 feet above grade. The final size, depth, and configuration of these facilities will be determined through more detailed planning and design.

Location: Adjacent to the Arthur R. Marshall Loxahatchee National Wildlife Refuge (WCA-1) (**Figures C-4 and C-5**)

Counties: Palm Beach

22. C-51 Backpumping and Treatment

Restudy Component Letter: Y

Geographic Region: Lower East Coast Service Area 1

Purpose: Reduce water supply restrictions in Northern Palm Beach County Service Area by providing additional flows from the C-51 West Basin to the West Palm Beach Water Catchment Area and enhance hydroperiods in Loxahatchee Slough.

Operation: Capture excess C-51 Canal water to meet urban water supply demands in the North Palm Beach Service Area. Water would be diverted from C-51 to a water treatment area and then into the West Palm Beach Water Catchment Area.

Design:

- 600 acres at four-feet maximum depth to be used for storm water treatment.
- Relocate the S-155A structure east of the intersection of Lake Worth Drainage District's E-1 Canal and the C-51 Canal and increase the capacity of S-155A as necessary to pass the additional inflows
- Improve conveyance between the C-51 Canal and the STA as necessary
- 450-cfs inflow pump to STA
- 100-cfs gravity discharge structure into West Palm Beach Water Catchment Area

Location: 600 acres located southwest of West Palm Beach Water Catchment Area (**Figures C-5 and C-10**)

Counties: Palm Beach

Assumptions and related considerations:

- Uncertainty in land availability
- Connection of the L-8 and C-51 basins

23. C-51 Regional Ground Water Aquifer Storage and Recovery

Restudy Component Letter: LL

Geographic Region: Lower East Coast Service Area 1

Purpose: This is a regional ground water ASR system which will capture and store excess water during wet periods and recover the water for utilization during dry periods. The ability to use the recovered water during dry periods will increase regional water resources.

Operation: Water will be captured and stored when water is being discharged out of S-155 to tide. Water will be recovered during dry periods based on canal elevations.

Design: This component consists of 34 well clusters located along the West Palm Beach Canal (C-51 Canal), each being composed of two surficial aquifer wells and one upper Floridan aquifer ASR well. The surficial aquifer wells will each have a 2.5-MGD withdrawal capacity and be located in proximity to the canal so that the water withdrawn would result in the interception of water that would otherwise go to tide during wet periods. Each upper Floridan aquifer ASR well will have a capacity of five MGD (the total injection and recovery capacity of the ASR system is 170 MGD or about 264 cfs). Water will be injected when stages in the C-51 Canal are above 8.0 ft NGVD. Water will be retrieved from the ASR wells when canal stages are below 7.8 ft NGVD. Recovered water will be discharged to the C-51 Canal.

Location: Along the C-51 Canal in eastern Palm Beach County, east of U.S. 441 (**Figure C-3**)

Counties: Palm Beach

Assumptions and related considerations: It is assumed that ground water ASR in proximity to the C-51 Canal is permissible without treatment.

24. Lake Worth Lagoon Restoration

Restudy Component Letter: OPE

Geographic Region: Lower East Coast Service Area 1

Purpose: Improve water quality and allow for the reestablishment of sea grasses and benthic communities. The elimination of the organically enriched sediment from the C-51 Canal discharge will provide for long-term improvements to Lake Worth Lagoon and enable success for additional habitat restoration and enhancement projects planned by Palm Beach County.

Operation: A prototype project will be conducted to determine if the lagoon sediments will either be removed or trapped.

Design: This feature includes sediment removal and trapping within the C-51 Canal and sediment removal or trapping within a 2.5-mile area downstream of the confluence of the C-51 Canal and the Lake Worth Lagoon.

Location: C-51 Canal/Lake Worth Lagoon (**Figures C-9** and **C-11**)

Counties: Palm Beach

25. Winsburg Farms Wetland Restoration

Restudy Component Letter: OPE

Geographic Region: Lower East Coast Service Area 1

Purpose: To create a wetland from water, which would normally be lost to deep well injection and any future beneficial use. The wetland will reuse a valuable resource, recharge the local aquifer system, create a new ecologically significant wildlife habitat, and extend the function of the nearby Wakodahatchee Wetland.

Operation: The feature will reduce the amount of treated water from the Southern Region Water Reclamation Facility wasted in deep injection wells by further treating and recycling the water.

Design: Construction of a 175-acre wetland

Location: East of Loxahatchee Wildlife Preserve (**Figures C-9** and **C-10**)

Counties: Palm Beach

26. Protect and Enhance Existing Wetland Systems along Loxahatchee National Wildlife Refuge including the Strazzulla Tract

Restudy Component Letter: OPE

Geographic Region: Lower East Coast Service Area 1

Purpose: Provide a hydrological and ecological connection to the Arthur R. Marshall Loxahatchee National Wildlife Refuge (WCA-1) and expand the spatial extent of protected natural areas. This increase in spatial extent will provide vital habitat connectivity for species that require large, unfragmented tracts of land for survival. It also contains the only remaining cypress habitat in the eastern Everglades and one of the few remaining sawgrass marshes adjacent to the coastal ridge. This is a unique and endangered habitat that must be protected. This area provides an essential Everglades landscape heterogeneity function

Operation: This land will act as a buffer between higher water stages to the west and lands to the east that must be drained.

Design: Water control structures and the acquisition of 3,335 acres

Location: East of Arthur R. Marshall Loxahatchee National Wildlife Refuge (WCA-1) (**Figure C-9**)

Counties: Palm Beach

27. Palm Beach County Agricultural Reserve Reservoir and Aquifer Storage and Recovery

Restudy Component Letter: VV

Geographic Region: Lower East Coast Service Area 1

Purpose: Increase water supply for central and southern Palm Beach County by capturing and storing water currently discharged to tide.

Operation: The reservoir will be filled during the wet season from excess water backpumped out of the western portions of the Lake Worth Drainage District (LWDD). Water will be released back to LWDD to maintain canal stages during the dry season. Regional water will be supplied to the LWDD when water level fall below 15.8 ft NGVD. Water will be backpumped into the reservoir when water levels are above 16.0 ft NGVD.

ASR capacity was added to improve supply during dry seasons and droughts. Fifteen five-MGD capacity ASR wells (total injection and recovery capacity of 75 MGD or about 116 cfs) were added. Water from the reservoir will be injected when depths in the impoundment are above one foot. The water supplied from the reservoir will be maximized (up to the outflow capacity) before water is supplied from ASR storage.

Design:

- 1,660 acres with a maximum depth of 12 feet (volume of 19,920 ac-ft)
- Inflow pump capacity = 500 cfs (provided by two 250-cfs pumps)
- Outflow structure capacity = 500 cfs at four-feet head
- Emergency outflow structure = 300 cfs

Location: The western portion of central Palm Beach County (**Figures C-3 and C-4**)

Counties: Palm Beach

Assumptions and related considerations:

- Excess storage could be discharged to the LWDD during off peak times
- Canal conveyance improvements for two laterals from LWDD's E-1 to the E-2.
- No operation changes in the LWDD

28. Change Coastal Wellfield Operations

Restudy Component Letter: L

Geographic Region: Lower East Coast Service Area 1

Purpose: Shift demands from eastern wellfields to western facilities away from the saltwater interface to reduce impact of saltwater intrusion.

Operation: For coastal utilities in the Lower East Coast Service Area which are experiencing an increased threat of saltwater intrusion, demands will be shifted from the eastern facilities to the western facilities away from the saltwater interface. The volume shifted is dependent upon the degree of saltwater intrusion, but is generally proportional to the increase in demands between the 1995 existing conditions and the 2020 future without-project conditions unless otherwise noted.

Design:

- The following utilities have a portion of their demands shifted inland: Riviera Beach, Lake Worth, Lantana, Manalapan, Boca Raton, Hollywood (including Broward County 3B and 3C), Dania, Miramar, Broward County 3A, Hallandale, and Florida City.
- Redistribution of demands for Lake Worth, Lantana, Manalapan, Boca Raton and Florida City are generally consistent with the LEC Plan.
- For Riviera Beach, demands will be shifted from the eastern facilities to the western facilities, with the western facilities absorbing the increased demand between the 1995 and 2020 conditions.
- Miramar's eastern wellfield will be placed on standby and all demands will be met from the western wellfield.
- The Hollywood, Hallandale, Dania, Broward County 3A, and Broward County 3B/3C wellfields will be placed on standby and the entire demand (with the exception of four MGD from the Floridan aquifer for Hollywood) will be met from the South Broward County Regional Wellfield.
- Recharge to the regional wellfield will be met through the existing canal system supplied from locally captured runoff from the C-9 Basin.

Location: Lower East Coast Service Area (**Figure C-2**)

Counties: Broward, Miami-Dade, and Palm Beach

Assumptions and related considerations:

- It is assumed that the western facilities of the individual utilities have sufficient capacity to meet the increased demands.

LOWER EAST COAST SERVICE AREA 2

29. Western C-11 Diversion Impoundment and Canal

Restudy Component Letter: Q

Geographic Region: Lower East Coast Service Area 2

Purpose: Divert untreated runoff from western C-11 that is presently discharged into WCA-3A through the C-11 STA and Impoundment to the North Lake Belt Storage Area (NLBSA).

Operation: Runoff in the western C-11 Canal that was previously backpumped into WCA-3A will be diverted to the C-11 STA and Impoundment and then to the NLBSA. If storage capacity is not available in the impoundment or NLBSA then the S-9 pump will be used for flood protection for the western C-11 Basin, which pumps to WCA-3A. To improve ground water elevations in the eastern C-11 Basin, the S-9 seepage divide structure will be operated to maintain the western C-11 Canal stage at an elevation of 3.0 ft NGVD.

Design:

- 2,500-cfs diversion canal west of U.S. 27 between the C-11 and C-9 canals and a 2,500-cfs conveyance capacity improvements to the C-9 Canal between S-30 and the NLBSA.
- Intermediate 2,500-cfs pump station in the C-11 Canal to direct runoff to the C-11 STA and Impoundment
- 1,600-acre STA and Impoundment with a maximum depth of four feet.
- Seepage collection canal and pump for C-11 STA and Impoundment
- 2,200-cfs structure to discharge from the Impoundment to the C-11 Canal, west of U.S. 27, to the diversion canal

Location: The diversion canal is located west of U.S. 27 between C-11 and C-9 canals. The C-11 STA and Impoundment is located northwest of the intersection of U.S. 27 and the C-11 Canal (**Figure C-5**).

Counties: Broward and Miami-Dade

Assumptions and related considerations:

- Flood protection component for Florida Power and Light (FPL) substation and mobile home park may be needed.
- Telemetry systems will be required for all operable structures and pump stations.

30. C-9 Stormwater Treatment Area/Impoundment

Restudy Component Letter: R

Geographic Region: Lower East Coast Service Area 2

Purpose: Treatment of water supply deliveries from North Lake Belt Storage Area (NLBSA) to the C-9, C-6/C-7, and C-2/C-4 canals. NLBSA is used to capture runoff from western C-9 and C-11 West basins by backpumping into the curtain-walled reservoir area. The C-9 Impoundment will provide treatment of runoff stored in NLBSA, ground water recharge within the basin, and seepage control of WCA-3 and buffer areas to the west.

Operation: Water supply deliveries from NLBSA to C-9, C-6/C-7 and C-2/C-4 canals will be pumped into the C-9 STA and Impoundment for treatment of the storm water runoff stored in the NLBSA. Seepage from the C-9 Impoundment will be collected and returned to the impoundment.

Design:

- 2,500 acres with a maximum depth of four feet.
- Inflow structure: 1,500-cfs pump (NLBSA) (to be resized as needed)
- Outflow structure: Gravity structure with 1,500-cfs capacity at four-foot head. Discharge C-9 Impoundment to the C-9, C-6/C-7, and C-2/C-4 canals for water supply deliveries.
- Seepage Collection: 200 cfs recycled into the impoundment area.

Location: See **Figure C-5**

Counties: Broward

Assumptions and related considerations:

- Additional treatment facility needed if stored water is backpumped into WCA-3A.
- Telemetry systems will be required for all operable structures and pump stations.

31. Broward County Secondary Canal System

Restudy Component Letter: CC

Geographical Region: Lower East Coast Service Area 2

Purpose: Increase pump capacity of existing facilities and construct additional canal and pump facilities for the Broward Secondary Canal System to provide recharge to wellfields located in central and southern coastal Broward County, stabilize the saltwater interface, and reduce storm water discharges to tide.

Operation: When excess water is available in the basin, water is pumped into the coastal canal systems to maintain canal stages. When local water is not sufficient to maintain canal stages, canals are maintained first from local sources and then from Lake Okeechobee and the WCAs. Local sources include the Hillsboro Impoundment and the North Lake Belt Storage Area. Secondary canals maintained are as follows:

- Broward County's C-2 Canal from the Hillsboro Canal
- North secondary canal from the C-13 Canal
- South secondary canal from the C-13 Canal
- Turnpike Canal south from the C-12 Canal
- Canals north from the C-9 Canal at levels discussed below

Design:

Canal conveyance:

- The canal conveyance of the secondary canal located east of the Florida Turnpike from the C-12 Canal south to the Fort Lauderdale Golf and Country Club will be improved. The design includes routing of water eastward to recharge the aquifer and help stabilize the saltwater interface at Fort Lauderdale. Canal conveyance improvements may also be necessary for the Old Plantation Water Control District's eastern canal and in southeastern Broward County.

Pump capacities and maintenance levels:

- 100-cfs pump from the Hillsboro Canal to the Broward County Secondary Canal
- 100-cfs pump from the C-13 Canal north to the Broward County Secondary Canal
- 100-cfs pump from the C-13 Canal south to the Broward County Secondary Canal
- 100-cfs pump on the East Turnpike Canal withdrawing water from the C-12 Canal
- 150-cfs pump on the C-9 Canal for maintaining water in southeastern Broward County

Canal improvements and control elevations:

- Improve East and West Turnpike canals and golf course lake system between the C-12 Canal and the North New River to achieve an average top width of 200 feet.
- The Turnpike canals shall be maintained at a minimum elevation of 4.0 ft NGVD.
- Improve canal/lake systems in southeastern Broward County and the Orangebrook Golf Course to have an average canal top width of 30 feet.
- The southeastern Broward Canal System shall be maintained at a minimum elevation of 2.5 ft NGVD.

Location. Broward County Secondary Canal System (**Figure C-10**)

County: Broward

Assumptions and related considerations:

- Canal levels are maintained from local basin runoff and sources. When water is not available from local sources, water is supplied to the canal systems from the regional system.
- Canal operations do not impact existing flood control levels.

LOWER EAST COAST SERVICE AREA 3

32. North Lake Belt Storage Area

Restudy Component Letter: XX

Geographic Region: Lower East Coast Service Area 3

Purpose: In-ground reservoir to capture a portion of runoff from the C-6, western C-11, and the C-9 basins. The in-ground reservoir with perimeter seepage barrier will allow storage of untreated runoff without concerns of ground water contamination. The stored water will be used to maintain stages during the dry season in the C-9, C-6, C-7, C-4, and C-2 canals and to provide deliveries to Biscayne Bay to aid in meeting salinity targets.

Operation:

- Inflows from the C-6 (west of the Turnpike), western C-11, and C-9 basins runoff are pumped and gravity fed into the in-ground reservoir. Inflow ceases when stages reach approximately 5.0 ft NGVD.
- Outflows for water supply are pumped to the C-9 STA/Impoundment prior to delivery to the C-9, C-6, C-7, C-4, and C-2 canals.
- Water from the reservoir can be withdrawn down to a stage of -15 ft NGVD (up to 20 feet of working storage and maximum head on seepage barrier). Land elevation is 5.0 ft NGVD.
- Prioritization of outflows:
 - If water levels in North Lake Belt Storage Area (NLBSA) are from between +5.0 ft NGVD and 0.0 ft NGVD, flows will be discharged to Biscayne Bay via the C-2 Canal.
 - If water levels in NLBSA are from between -10.0 ft NGVD and 0.0 ft NGVD, flows will be discharged to the C-9, C-6, C-7, C-4, and C-2 canals only to prevent saltwater intrusion.
 - If water levels in NLBSA drop to levels between -15.0 ft NGVD and -10.0 ft NGVD, flows will be limited to discharge to the C-9 Canal only to avoid water shortage restrictions.

Design:

Reservoir:

- Reservoir will be approximately 1,900 acres with subterranean seepage barrier around perimeter to enable drawdown during dry periods, prevent seepage, and to prevent water quality impacts. The total acreage in the Restudy (USACE and SFWMD, 1999) is approximately 4,500 acres which is expected to be completed by 2050. The targeted acreage to be completed by 2020 is 1,900 acres.

Inflow Structures:

- 2,500-cfs gravity structure at 0.5-feet head, from the western C-11 Basin
- 600-cfs pump from the C-9 Basin
- 300-cfs pump from the C-6 Basin, west of the divide structure

Outflow Structures:

- 1,000-cfs pump to the C-9 STA/Impoundment for treatment prior to deliveries to the C-6, C-7, C-2, C-4, and C-9 canals to prevent saltwater intrusion in coastal canals.
- STA detention time requirements need to be addressed. Pretreatment in reservoir may reduce size requirements of treatment area.

Canal:

- Water supply discharges are routed to the C-4/C-2 canals via a canal to be located east of the Snapper Creek Canal (Northwest Wellfield Protection Canal System). Canal capacity will be 800 cfs.
- Two 1,400-cfs delivery structures will be built at the new canal's confluences with the C-6 and the C-4 canals.

Location: Reservoir would be located within the area proposed for rock mining by the Lake Belt Issue Team. It would be located north of the Miami Canal (C-6) and south of the C-9 Canal to minimize impacts to the Northwest Wellfield (**Figure C-4**).

Counties: Miami-Dade

Assumptions and related considerations:

- The subterranean wall will have no adverse effect on Miami-Dade County's Northwest Wellfield.
- A treatment facility will be needed if stored water is backpumped to the Everglades
- All water quality considerations will be addressed regarding releases from the reservoir to the water supply wellfields.
- Impacts on the cone of influence of the Northwest Wellfield and its effect on wetland mitigation around the wellfield.
- Limestone filter treatment system within the reservoir may be developed through use of compartmentalization of rock mining excavation patterns.
- Telemetry systems will be required for all operable structures and pump stations.
- Any specific water quality considerations regarding capture of C-6 Basin runoff will be addressed during the detailed design stage.
- Increased drawdown will be investigated in a pilot study to assess surcharge of connate water, sheer stress on impermeable barrier, and other uncertainties regarding the Lake Belt storage areas.

33. Central Lake Belt Storage Area

Restudy Component Letter: S

Geographic Region: Lower East Coast Service Area 3

Purpose: In-ground reservoir to receive excess water from WCA-2B, WCA-3A, and WCA-3B. This in-ground reservoir, the Central Lake Belt Storage Area (CLBSA), will have a perimeter seepage barrier, that will allow storage of large quantities of water without ground water seepage losses in this highly transmissive region. The water stored in CLBSA will be provided to 1) Northeast Shark River Slough, 2) WCA-3B, and 3) to supply flows to Biscayne Bay when available.

Operation:

- Inflows from the L-33 Canal are through a 1,500-cfs pump. Inflow ceases when stage reaches approximately five ft NGVD (16 feet above adjacent land elevation). Inflows from the L-33 Canal are diverted to CLBSA when flows are available from WCA-2B, WCA-3A, and WCA-3B, and when deliveries are not desired to meet targets in Northeast Shark River Slough.
- Outflows for water deliveries are pumped through a polishing marsh cell prior delivery to Northeast Shark River Slough via the L-30 Canal and a reconfigured L-31 N Canal.
- Deliveries of water to Northeast Shark River Slough to maintain inundation will occur when Northeast Shark River Slough dries below trigger levels and target hydroperiods simulations call for Northeast Shark River Slough to be inundated. CLBSA delivers water to WCA-3B through polishing marsh cells via the L-30 Canal to inundate the eastern area of WCA-3B to a six-inch depth when triggers call for deliveries. This delivery occurs when WCA-3B dries below six inches above ground and target hydroperiods simulations indicate inundation in WCA-3B. When available, outflows will be directed to Biscayne Bay through discharges to Snapper Creek at the Turnpike.
- Water supply from the reservoir can be withdrawn for stages down to -15 ft NGVD (up to 20 feet of working storage and maximum head on seepage barrier). Land elevation is 5.0 ft NGVD.
- Full excavation of CLBSA will be 5,200 acres with subterranean seepage barrier around the perimeter to enable drawdown during dry periods and to prevent seepage losses. By 2020, 2,600 acres will have been excavated within the CLBSA boundary.

Design

Reservoir

- 2,600 acres with subterranean seepage barrier to enable drawdown during dry periods, prevent seepage, and to prevent water quality impacts (Restudy design includes 5,200 acres of in-ground reservoirs which are expected to be completed by 2050; targeted acreage to be completed by 2020 is 2,600 acres)

Inflow Structures:

- 1,500-cfs pump from the L-33 Borrow Canal
- 500-cfs structure at the S-9 Pump Station to gravity discharge from WCA-3A to the L-33 Canal
- 700-cfs structure (Existing S-31) for WCA-3B to CLBSA via the C-6 Canal

Outflow Structures:

- 800-cfs pump to polishing cell to make deliveries to Northeast Shark River Slough and WCA-3B
- 500-cfs pump off the L-30 Canal to deliver to WCA-3B
- 300-cfs pump to make deliveries for Snapper Creek Canal
- 1,100-cfs structure at 0.5-foot head to provide regional system deliveries to the Snapper Creek Canal via the C-6 Canal if the CLBSA is out of water

Location: Reservoir would be located within the area proposed for rock mining by the Lake Belt Issue Team. It would be sited south of Miami Canal (C-6) and north of the Northwest Wellfield Delivery Canal to minimize impacts to the Northwest Wellfield (**Figure C-4**).

Counties: Miami-Dade

Assumptions and related considerations:

- The subterranean wall will have no adverse effect on Miami-Dade County's Northwest Wellfield.
- A treatment facility will be needed if stored water is backpumped to the Everglades (640-acre STA).
- All water quality considerations will be addressed regarding releases from the reservoir to the water supply wellfields.
- Impacts on the cone of influence of the Northwest Wellfield and its effect on wetland mitigation around the wellfield.
- Limestone filter treatment system within the reservoir may be developed through use of compartmentalization of rock mining excavation pattern.
- Telemetry systems will be required for all operable structures and pump stations.
- Increased drawdown will be investigated in a pilot study to assess surcharge of connate water, sheer stress on impermeable barrier, and other uncertainties regarding the Lake Belt storage areas.

34. C-4 Control Structures

Restudy Component Letter: T

Geographic Region: Lower East Coast Service Area 3

Purpose: The proposed structures (East and West) would provide two separate benefits. The West Structure would control water levels in the C-4 Canal at higher elevation to reduce seepage losses from the Pennsuco Wetlands and areas to the west of the structure. The East Structure would reduce regional system deliveries by diverting dry season storm water flows to the C-2 Canal to increase recharge to several nearby coastal wellfields.

Operation: The West Structure would maintain water levels at 6.5 ft NGVD for seepage control purposes and be capable of passing flood flows with a minimum of head loss and supplying water to the C-4 Basin to meet demands. The East Structure would divert dry season storm water flows from the western C-4 Basin to the C-2 Canal to recharge the wellfields in the eastern C-2 Basin.

Design:

- East Structure - Operable liftgate with 4.5 ft NGVD overflow and approximately 400-cfs capacity (final design specifications will be determined in the future in detailed design and hydrologic and hydraulic modeling).
- West Structure - Operable liftgate with 6.5 ft NGVD overflow and approximately 600-cfs capacity (final design specifications will be determined in the future in detailed design and hydrologic and hydraulic modeling).

Location: East Structure will be located just downstream of the Dade-Broward Levee in the C-4 Canal (**Figure C-10**) and the West Structure will be in the C-4 Canal, just downstream of the confluence of the C-2 and C-4 canals (**Figure C-8**).

Assumptions and related considerations:

- Benefits to WCA-3B associated with improved C-4 Canal seepage control are directly related to the proposed G-356 pumpage (Modified Water Deliveries).
- Head losses across the proposed structures will not inhibit passing flood releases when they are necessary.
- A pump may be associated with the West Structure if backpumping the C-4 Basin runoff to the Bird Drive Recharge Area becomes a Water Resource Project.

35. Pineland and Hardwood Hammocks Restoration

Restudy Component Letter: OPE

Geographic Region: Lower East Coast Service Area 3

Purpose: The purpose of this feature is to restore hammocks to a portion of the Frog Pond which has been purchased by the District as part of the C-111 Project to restore the Taylor Slough portion of the Everglades.

Operation: This feature will provide some water quality treatment for runoff passing through the hammocks and will demonstrate the techniques required to reestablish native conifer and hardwood forests on land that has been rock plowed.

Design: This feature includes restoring South Florida slash pine and hardwood hammock species on a 200-foot wide strip on each side of two miles of State Road 9336 from the C-111 Canal to the L-31W Borrow Canal (approximately 50 acres) and the establishment of two one-acre hammocks in low lying areas on each side of the road.

Location: Each side of two miles of State Road 9336 from the C-111 Canal to the L-31W Borrow Canal (Figure C-9)

Counties: Miami-Dade

36. Bird Drive Recharge Area

Restudy Component Letter: U

Geographic Region: Lower East Coast Service Area 3

Purpose: Captures runoff from the western C-4 Basin and accepts inflows from the West Dade Wastewater Treatment Plant (WTP) to recharge ground water and reduce seepage from the Everglades National Park buffer areas by increasing water table elevations east of Krome Avenue. The facility will also provide C-4 Basin flood peak attenuation and water supply deliveries to the South Dade Conveyance System and Northeast Shark River Slough.

Operation: Inflows from the western C-4 Basin and the West Dade WTP will be pumped into the proposed recharge area. C-4 runoff in excess of 200 cfs will be discharged eastward. Inflows from the West Dade WTP will be continuous when the recharge area depth is equal to or less than three feet above ground. West Dade WTP discharges will be to deep injection wells if the depth is greater than three feet. A seepage management system will be operated around the eastern and southern perimeters of the recharge area. Recharge area outflows will be prioritized to meet 1) ground water recharge demands, 2) South Dade Conveyance System demands, and 3) Northeast Shark River Slough demands, when supply is available. Regional system deliveries will also be routed through the seepage collection canal system of the Bird Drive Recharge Area to the South Dade Conveyance System, which should reduce seepage from areas west of Krome Avenue.

Design: Approximately 2,877 acres with a maximum depth of four feet

Inflow structure

- 200-cfs pump (to be resized as needed) from the C-4 Basin

Outflow structure

- Water supply - Gravity structure with 200-cfs capacity at two feet of head
- Seepage Collection System - up to 500-cfs pump to control seepage collection canal at 5.0 ft NGVD; seepage is returned to Bird Drive Recharge Area

Delivery System

- 800-cfs pump to provide regional system deliveries to the South Dade Conveyance System
- 800-cfs canal capacity, in addition to the canal required for the Bird Drive seepage collection system, to pass the regional system deliveries to the South Dade Conveyance System
- Five miles of canal with 800-cfs capacity between the Bird Drive seepage collection system to the C-1W Canal, just east of Krome Avenue
- Relocate S-338 east of Krome Avenue and delivery canal

Location: Located in the northwestern four sections of the Bird Drive Basin (**Figure C-4**).

Counties: Miami-Dade

Assumptions and related considerations:

- Treatment facility will be needed if seepage collected does not meet Everglades standards.
- Telemetry systems will be required for all operable structures and pump stations.
- Flood protection in the basin will not be removed by the introduction of the West Dade WTP inflows.
- Regional-scale simulation using SFWMM, 2 mile by 2 mile resolution is rather coarse for this local-scale feature. Specific land elevations in the Bird Drive Recharge Area are not precisely mimicked due to location and scale considerations in the SFWMM.
- In the south Miami-Dade County ground water model, elevations have been modified to more accurately reflect current conditions.

37. L-31N Levee Improvements for Seepage Management

Restudy Component Letter: V

Geographic Region: Lower East Coast Service Area 3

Purpose: Levee seepage management along the eastern edge (L-31N) of Everglades National Park to eliminate losses due to levee seepage to the east coast of Florida. An additional feature has been added to reduce all wet season seepage/ground water flows to the east. This feature will help restore hydropatterns in Everglades National Park.

Operation: 100 percent reduction in levee seepage flow from Everglades National Park year-round. Further 100 percent reduction in all ground water flows during the wet season. Bird Drive Recharge Area and North Lake Belt Storage Area will be used to recharge aquifers to the east.

Design:

- Levee seepage will be managed by relocating and enhancing the L-31N Canal, ground water wells, and the sheetflow delivery system adjacent to Everglades National Park
- Wet season ground water seepage will be managed by distributing ground water wells adjacent to the L-31N Levee and returning flows to Everglades National Park
- If needed, aquifer recharge will occur from deliveries from the Bird Drive Recharge Area and the North Lake Belt Storage Area.

Location: Along the existing eastern protective levee (L-31N) adjacent to Everglades National Park (Figure C-8)

Counties: Miami-Dade

38. Dade-Broward Levee/Pennsuco Wetlands

Restudy Component Letter: BB

Geographic Region: Lower East Coast Service Area 3

Purpose: Reduce seepage to the east from the Pennsuco wetlands and southern WCA-3B and enhance hydroperiods in the Pennsuco. Also an improved Dade-Broward Levee will enhance recharge to Miami-Dade County's Northwest Wellfield.

Operation: Improvements to the Dade-Broward Levee and associated conveyance system will reduce seepage losses to the east and provide recharge to Miami-Dade County's Northwest Wellfield. Seepage reduction will enhance hydroperiods in Pennsuco wetlands and hold stages higher along southeastern WCA-3B. Recharging the conveyance features of the Dade-Broward levee from the regional system deliveries provides recharge to Miami-Dade County's Northwest Wellfield. Treatment areas will be provided, if necessary, to meet all water quality standards required.

Design: Improve the Dade-Broward Levee by doing the following:

- Construct or improve existing levee to five-foot height with two-foot top width, while creating or improving existing conveyance to a capacity of up to 300 cfs
- 150-cfs bypass structure and canal from C-6 Canal to Dade-Broward Levee to provide recharge from the regional system via the improved U.S. 27 Borrow Canal
- 150-cfs gravity structure in the Dade-Broward Levee borrow canals due west of the southern end of the Northwest Wellfield
- When the Conveyance Channel is below 5.0 ft NGVD at the C-4 structure located at the southern end of the Dade-Broward Levee

Location: Dade-Broward Levee, Pennsuco Wetlands, WCA-3B, the Central Lake Belt Storage Area, and Miami-Dade County's Northwest Wellfield (**Figure C-8**)

Counties: Miami-Dade

Assumptions and related considerations:

- Wellfield protection must be maintained through recharge of acceptable water quality.
- Secondary structures within the recharge canals may be needed to provide seepage reduction and desired wellfield recharge.
- The stage maintained in the Dade-Broward Levee conveyance is subject to change.

39. Modification to South Dade Conveyance System in Southern Portion of L-31N and C-111 Canals

Restudy Component Letter: OO

Geographic Region: Lower East Coast Service Area 3

Purpose: To improve deliveries to Everglades National Park and decrease potential flood risk in the Lower East Coast Service Area 3.

Operation:

- Modify C-111 Canal operations

Design:

- S-332D Pump Station at 500 cfs
- Remove S-332B Pump Station
- Add 100 cfs to S-332C Pump Station (keep total of S-332 A-D pump stations less than 1,200 cfs)
- Remove S-332 Pump Station
- Remove S-332D Tieback Canal which provides flow from the C-111 Canal to the S-332 Pump Station

Location: South Dade Conveyance System (**Figure C-7**)

Counties: Miami-Dade

Assumptions and related considerations:

- This component will not cause adverse impacts to Everglades National Park and south Dade agricultural lands.
- This component is dependent on construction of the S-356 A and B structures (**Component 49**).

40. Reroute Miami-Dade County Water Supply Deliveries

Restudy Component Letter: SS

Geographic Region: Everglades Agricultural Areas and Lower East Coast Service Area 3

Purpose: Reroute water supply deliveries made to Miami-Dade County from the Miami and Tamiami Canals and WCA-3, to the North New River Canal due to the backfilling of the Miami Canal as part of the decompartmentalization of WCA-3.

Operation: Send water supply deliveries from Lake Okeechobee to Miami-Dade County southeast through the North New River Canal in the EAA (L-20, L-19, and L-18 canals) to the S-150 Structure. From the S-150 Structure, send deliveries into the L-38W Canal and at the southern terminus of the L-38W Canal south through a 1,500-cfs pump to the borrow canal along the west side of U.S. 27.

Design:

- Double the capacity of the North New River Canal south of the proposed EAA Storage Reservoir to convey additional water supply deliveries to Miami-Dade County, as necessary
- Double the capacity of S-351 and S-150 to pass additional water supply deliveries to Miami-Dade County, as necessary
- Improve conveyance in the borrow canal on the west side of U.S. 27 between the L-38W Canal and the Miami Canal, as necessary to pass the additional flows
- Pump intake at the S-7 Structure will be lowered to 8.0 ft NGVD

Location: EAA and WCA-3 (**Figure C-7**)

Counties: Palm Beach, Broward, and Miami-Dade

Assumptions and related considerations: Operational flexibility is reduced since there is only one delivery route to Miami-Dade County (backup routes have been eliminated).

41. C-111N Spreader Canal

Restudy Component Letter: WW

Geographic Region: Lower East Coast Service Area 3

Purpose: To reduce wet season flows in the C-111 Canal, improve deliveries to Model Lands and Southern Glades, and decrease potential flood risk in the lower south Miami-Dade area.

Operation: Water is pumped from the C-111 and C-111E canals into a STA prior to pumping through the S-332E Pump Station into the C-111N Spreader Canal to Southern Glades and Model Lands. The S-197 and S-18C structures are removed and the C-111 Canal is backfilled.

Design:

- Increase the S-332E Pump Station to 500 cfs from 50 cfs (pump when available)
- Relocate the C-111N Spreader Canal to SW 440th Street (approximately one section north)
- Culvert under U.S. 1
- Culvert under Card Sound Road
- Canal through triangle area of Model Lands, east of Card Sound Road
- Fill in the C-111 Canal south of confluence with the C-111N Spreader Canal to the S-197 Structure
- Remove levees and access roads
- Completely backfill the C-110 Canal
- Create a STA in the triangle of land between the C-111 Canal and the C-111E Canal to clean water prior to putting in Model Lands STA

Location: South Dade Conveyance System (**Figure C-5**)

Counties: Miami-Dade

Assumptions and related considerations:

- This component will not cause adverse impacts to south Dade agricultural and urban lands.
- The water discharged from the C-111 and C-111E canals is assumed to be clean.

42. South Miami-Dade County Reuse (South District Reclaimed Water Treatment Plant)

Restudy Component Letter: BBB

Geographic Region: Lower East Coast Service Area 3

Purpose: The existing South District Reclaimed Wastewater Treatment Plant located north of the C-1 Canal will provide wastewater treatment coupled with superior treatment technology to supply reclaimed water to the South Biscayne Bay and Coastal Wetlands Enhancement Project. The water will be provided upon demand throughout the year to augment water supply to the project. This supplemental water will restore overland flow in the coastal area and recharge ground water to enhance ground water discharge to Biscayne Bay. Saltwater intrusion benefits to the southern part of Dade County are anticipated.

Operation: The South District Reclaimed Water Treatment Plant, with superior treatment technology, will be operated when the additional water is needed to supply the South Biscayne Bay and Coastal Wetlands Enhancement Project. When water is not needed, the water treatment plant will stop treatment beyond secondary treatment standards and will dispose of the secondary treated effluent into the existing deep injection wells.

Design: The South District Reclaimed Water Treatment Plant will be designed to add on a pretreatment and membrane treatment system to the existing secondary treatment facility. The plant will have a capacity of 131 MGD. It is anticipated that phosphorus will be the constituent of concern in the reclaimed water. Therefore, the treatment will be designed to remove total phosphorous to acceptable levels.

The reclaimed water will be discharged to the C-1 Canal (Black Creek), upstream of the S-21A Structure, and then delivered southward towards the C-102 and C-103 canals, and northward towards the C-100 Canal. The wastewater treatment facility will provide advanced treated water to the L-31E Canal. Flow southward in the L-31E Canal towards the C-102 and C-103 canals shall be 202 ac-ft per day. Flow northward in the L-31E Canal towards the C-100 Canal shall be 200 ac-ft per day (through a canal extension). The combined inflow into the L-31E Canal shall be 402 ac-ft per day for every day of the simulation. Flows will reach the C-102 and C-100 canals via modifications to the L-31E Canal.

Location: The South District Reclaimed Water Treatment Plant will be located at, or in the vicinity of, the existing South District Wastewater Treatment Plant (**Figure C-6**).

County. Miami-Dade County

Assumptions and other considerations:

- The reuse facility uses advanced treatment resulting in water quality acceptable to the Biscayne Bay.
- No adverse impacts will occur to adjacent agricultural or urban areas.
- Discharge capacity at the S-123, S-20F, S-21, and S-21A structures is sufficient to pass basin runoff and inflows from the reuse facility during storm events.

43. West Miami-Dade County Reuse

Restudy Component Letter: HHH

Geographic Region: Lower East Coast Service Area 3.

Purpose: The future West Miami-Dade Wastewater Treatment Plant, will be located immediately south of the Bird Drive Recharge Area and east of the relocated L-31 North Protective Levee. It will provide wastewater treatment coupled with superior treatment technology to supply reclaimed water to the Bird Drive Recharge Area. The water will be supplied year-round, as needed, to enhance ground water recharge. Excess water, when available, will be sent as a second priority to the South Dade Conveyance System, to Northeast Shark River Slough as a third priority, and to deep injection wells when there are no demands from the three designated priorities.

Operation: The proposed reclaimed water production facility will be operated by Miami-Dade County and has the potential to discharge 100 MGD. As stated previously, the water will be provided to three prioritized demands: Bird Drive Recharge Area, South Dade Conveyance System, and Northeast Shark River Slough. When all demands have been met, the West Miami-Dade Wastewater Treatment Plant will stop treatment beyond secondary treatment standards and will dispose of the secondary treated effluent into deep injection wells.

Design:

- Treatment will be biological nutrient removal advanced wastewater treatment followed by a superior treatment technology using iron salts to lower phosphorus to levels required for Everglades discharges.
- The iron salt coagulation system would be designed for a constant flow rate of 100 MGD.
- The West Miami-Dade Wastewater Treatment Plant will pump superior, advanced treated water at a rate of 155 cfs (100 MGD) to the Bird Drive Recharge Area when the elevation of the recharge area is equal to or below three ft NGVD.

Location: South of the Bird Drive Recharge Area and east of the relocated L-31 North Protective Levee (Figure C-6)

Counties: Miami-Dade

Assumptions and related considerations: The superior treatment technology will be able to treat the advanced wastewater treatment effluent to remove phosphorous and nitrogen to the low levels desired to meet state water quality standards and provide an acceptable water quality for the above priorities.

WATER CONSERVATION AREAS AND EVERGLADES NATIONAL PARK

44. Loxahatchee National Wildlife Refuge Internal Canal Structures

Restudy Component Letter: KK

Geographic Region: Arthur R. Marshall Loxahatchee National Wildlife Refuge (WCA-1)

Purpose: Improve timing and location of water depths in the Arthur R. Marshall Loxahatchee National Wildlife Refuge (WCA-1)

Operation: Structures would remain closed except to pass STA-1 East and STA-1 West outflow and water supply deliveries.

Design:

- L-7 Borrow Canal structure: 1,500-cfs gravity structure at 0.5-foot head.
- L-40 Borrow Canal structure: 1,500-cfs gravity structure at 0.5-foot head.

Location: The L-7 Structure is located at cell R28C50 in the L-7 Borrow Canal within the Arthur R. Marshall Loxahatchee National Wildlife Refuge (WCA-1). The L-40 Structure is located at cell R34C50 in the L-40 Borrow Canal within the refuge (**Figure C-9**).

Counties: Palm Beach

Assumptions and related considerations: STA discharges to the Arthur R. Marshall Loxahatchee National Wildlife Refuge (WCA-1) are assumed to be of acceptable water quality.

45. Everglades Rain-Driven Operations

Restudy Component Letter: H

Geographic Region: Water Conservation Areas and Everglades National Parks

Purpose: Improve timing and location of water depths in the WCAs and Everglades National Park. The rain-driven operational concept is a basic shift from the current operational practice, which uses calendar based regulation schedules for the WCAs. Regulation schedules, also referred to as flood control schedules, typically specify the release rules for a WCA based on the water level at one or more key gages. Regulation schedules do not typically contain rules for importing water from an upstream source. The schedules also repeat every year and make no allowance for interannual variability. The rain-driven operational concept includes rules for importing and exporting water from the WCAs to mimic a desired target stage hydrograph at key locations within the Everglades system. The target stage hydrographs mimic an estimate of the predrainage Everglades water level response to rainfall.

Operation: Note that for the description below, the term trigger level means the water level used to trigger action at an upstream or downstream structure. Trigger levels are related to the target stage hydrographs by simple offsets which typically range less than plus or minus one foot. One trigger level is usually associated with the import rules and two trigger levels are associated with the exportation of water. The two export trigger levels define two release zones. The lower zone is a conditional release zone and releases are made only if the downstream area needs the water. The upper zone is an unconditional release, or flood control, release zone and releases are made in this zone even if the downstream area does not need the water.

WCA-1:

- No rain-driven operations (use 1995 interim regulation schedule)

WCA-2 Import Rules:

- Import water from Lake Okeechobee via STA-2 if water levels fall below trigger levels in northern WCA-2A (SFWMM grid cell R45C28).

WCA-2 Export Rules:

- Export water from WCA-2A to WCA-2B via S-144, S-145, and S-146, if levels at 2A-17 exceed trigger levels.
- Export water from WCA-2A via the S-11 Structure if levels at 2A-17 exceed triggers.
- Export water from WCA-2B to Everglades National Park via new structures at the south end of WCA-2B if levels at central WCA-2B (R36C30) exceed trigger levels.

WCA-3 Import Rules:

- Import water from EAA storage and/or Lake Okeechobee via STA-3/4 to the following:
 - Northeast WCA-3A if levels fall below trigger levels at 3A-NE.
 - Northwest WCA-3A (via L-5/L-4, S8, G404, and a spreader along L-4) if levels fall below trigger levels at 3A-NW.
 - Central WCA-3A, via an improved S-140 and a spreader along the southernmost eight miles of L-28 (north reach), if levels fall below trigger levels at 3A-4.
 - Import water from WCA-2A via S-11 Structures if levels fall below trigger levels at 3A-3 (and WCA-2 has excess water [levels at 2A-17 significantly exceed targets]).

WCA-3 Export Rules:

- Export water from WCA-3A to WCA-3B via proposed L-67 weir structures if water levels upstream of weirs exceed their respective crest elevations (passive structures).
- Export water from WCA-3A to WCA-3B via proposed S-345 and S-349 structures if water levels at R33C26 exceed trigger levels.
- Export water from WCA-3A to Central Lake Belt Storage Area, via proposed gravity structure near S-9, if water levels at R26C33 exceed trigger levels.
- Export water from WCA-3B to Central Lake Belt Storage Area, via S-31, if water levels at R30C27 exceed trigger levels.

Everglades National Park Import Rules:

- Import water from WCA-3A via proposed S-345 and S-349 structures if average water levels at NESRS-1 and NESRS-2 fall below trigger levels.
- Import water from Central Lake Belt Storage Area via proposed S-356A and S-356B structures if levels at G-1502 fall below trigger levels.
- Import excess water from WCA-2B, via improved L-37 and L-33 canals and S-356A and S-356B.

Design:

- Deliveries from upstream sources (EAA runoff, EAA storage area, and/or Lake Okeechobee) through the STAs prior to release into the WCAs.
- Distribution of STA outflow designed to improve hydropatterns.
- Flows to Everglades National Park from WCA-3A and WCA-3B are uncontrolled since the S-355 and S-12 structures, the L-29 Canal, and the L-29 Borrow Canal are removed to allow overland flow from WCA-3A and WCA-3B to Everglades National Park.

Location: Within the existing boundaries of the WCAs and Everglades National Park (**Figure C-2**)

Counties: Broward, Miami-Dade, Monroe, and Palm Beach

Assumptions and related considerations:

- Consideration given to tree islands and minimum floor levels consistent with the District's proposed minimum flows and levels for these areas.
- Potential increases in hydropatterns in relatively overdrained areas (e.g., northern WCA-3A) and decreases in hydropatterns in deep water areas (e.g., southern WCA-3A).

46. Divert Flows from Water Conservation Area 2 to Central Lake Belt Storage Area

Restudy Component Letter: YY

Geographic Region: Water Conservation Area 2 and Lower East Coast Service Area 3.

Purpose: Capture excess water in WCA-2B to reduce stages above desired target levels in WCA-2B and to divert water through improved L-37 and L-33 borrow canals to Northeast Shark River Slough to meet targets or to the Central Lake Belt Storage Area (CLBSA).

Operation: Surface water in WCA-2B above Natural System Model (NSM) levels will overflow through three structures along the L-35 and L-35A borrow canals to the North New River Canal along with seepage from WCA-2B and be pumped to the L-37 Borrow Canal. The North New River Canal and the L-37 and L-33 borrow canals will be improved to accept this additional flow along with the seepage collected from WCA-3. This water will be pumped to Northeast Shark River Slough if the slough is below target levels or into a lined reservoir, referred to as the CLBSA, located south of the confluence of the L-33 and the C-6 canals.

Design:

- Three diversion structures with 120-cfs capacity at 0.5 feet of head and 350-cfs capacity at 4.0 feet of head along the southern perimeter of WCA-2B
- Intermediate 1,500-cfs pump station to divert overflow and seepage from the North New River Canal to the L-37 Borrow Canal
- Inverted siphon with 1,500-cfs capacity to pass water supply deliveries from the L-38 Borrow Canal to the U.S. 27 West Borrow Canal
- Improved conveyance of the L-37 and L-33 borrow canals to 3,000 cfs to handle WCA-2B flows plus seepage from WCA-3
- Remove S-9XN and S-9XS or improve structures to accommodate increased flows

Location: The overflow structures are located along the southern levee of WCA-2B. The L-37 and L-33 borrow canal improvements are located east of the protective levees and 0.5 miles west of U.S. 27 between the North New River and Miami canals (**Figure C-7**).

Counties: Broward

Assumptions and related considerations:

- Prioritization of use of CLBSA water
- Telemetry systems will be required for all operable structures and pump stations

47. Water Conservation Area 3A and 3B Levee Seepage Management

Restudy Component Letter: O

Geographic Region: Water Conservation Area 3

Purpose: Reduce seepage from WCA-3A and WCA-3B to improve hydropatterns within the WCAs by allowing higher water levels in the borrow canals and longer inundation durations within the marsh areas that are located east of the WCAs and west of U.S. 27. Seepage from the WCAs and marshes will be collected and directed south into the Central Lake Belt Storage Area. This will maintain flood protection and the separation of seepage water from urban runoff originating in the C-11 Basin and Lake Okeechobee water supply deliveries.

Operation: The L-37 and L-33 borrow canals will be held at higher stages as part of the WCA-2 seepage collection and conveyance system. Seepage collected in the L-37 and L-33 borrow canals and from the marsh areas will be directed into the WCA-2 seepage collection and conveyance system and directed south into the Central Lake Belt Storage Area or directly to Northeast Shark River Slough.

Design:

- New levees will be constructed west of U.S. 27 from the North New River Canal to the Miami (C-6) Canal to separate seepage water from the urban runoff in the C-11 Diversion Canal.
- The L-37 and L-33 borrow canals will be controlled at higher stages, as will the marshes located east of the WCAs.
- A divide structure will be added to the C-11 Canal west of U.S. 27 to maintain the separation of seepage water from urban runoff.
- Water from the C-11 West Canal will be diverted to the North Lake Belt Storage Area.

Location: Seepage will be collected in borrow canals along the existing eastern protective levees adjacent to WCA- 3. The divide structure will be located in C-11 Canal east of U.S. 27 (**Figure C-8**).

Counties: Broward

Assumptions and related considerations:

- It is assumed that the seepage from the WCAs meets the water quality standards necessary to achieve ecosystem restoration.

48. Additional S-345 Structures

Restudy Component Letter: AA

Geographic Region: Central and southern Everglades, Water Conservation Areas, and Everglades National Park

Purpose: The compartmentalization of the WCAs has contributed to the loss of historic overland flows of the central Everglades slough system. This alteration of flows has resulted in temporal changes in hydropatterns and hydroperiods in the historic deep water, central axis of the Shark Slough system. This component adds conveyance to WCA-3B to help in reestablishing NSM-like hydroperiods and hydropatterns in WCA-3B and Northeast Shark River Slough.

Operation: The addition of a Northeast Shark River Slough rainfall trigger well and modification of western Shark Slough Basin rainfall triggers deliver additional flows to the basin. Modification of the L-67A Borrow Canal decreases downstream conveyance to the S-12 Structure required to promote surface water flows to WCA-3B and to Northeast Shark River Slough.

Design: Triple the total discharge capacity of the S-345 Structure to 4,500 cfs and the addition of associated plugs (S-349).

Location: The additional structures and plugs are to be spaced evenly along the southern half of the L-67A Borrow Canal (**Figure C-7**).

Assumptions and related concerns: The emphasis is in reestablishing the historic, persistent, deep water slough that existed in WCA-3B and Northeast Shark River Slough.

49. Construction of S-356 Structures and Relocation of a Portion of L-31N Borrow Canal

Restudy Component Letter: FF

Geographic Region: Everglades National Park and Lower East Coast Service Area 3

Purpose: To improve deliveries to Northeast Shark River Slough in Everglades National Park and reduce seepage to Lower East Coast Service Area 3.

Operation:

- Redirect the S-357 Structure outflow from the L-31N Borrow Canal to the midpoint of the Modified Water Deliveries (MWD) Mitigation Canal northwest of the 8.5-Square Mile Area
- Operate new S-356 pumps to direct seepage collection from the WCAs and water deliveries from the Central Lake Belt Storage Area to Northeast Shark River Slough

Design:

- Remove MWD S-356
- Relocate MWD S-357
- Add S-356A and S-365B structures (900 cfs each) at locations along the modified L-31N Borrow Canal between G-211 and Tamiami Trail
- Reroute the L-31N Borrow Canal to east side of the buffer cell
- Relocate the L-31N Borrow Canal to east side of the buffer cell
- Backfill portion of the L-31N Borrow Canal where levee has been moved
- Five-foot levee along west side of existing lakes

Location: The L-31N Borrow Canal, along the east side of Northeast Shark River Slough (**Figures C-7 and C-8**)

Counties: Miami-Dade

Assumptions and related considerations:

- Water quality is not a problem
- No adverse impacts to areas east of the L-31N Borrow Canal

50. Decomartmentalize Water Conservation Area 3

Restudy Component Letter: QQ

Geographic Region: Water Conservation Areas and Everglades National Park

Purpose: Remove most flow obstructions to achieve unconstrained or passive flow between WCA-3A and WCA-3B and Northeast Shark River Slough and reestablish the ecological and hydrologic connection between these areas

Operation: Rain-driven trigger gages in northwest Shark River Slough and sheetflow to Everglades National Park (referred to as Everglades Rain-Driven Operations)

Design:

Structural Changes:

- Backfill the Miami Canal in WCA-3 from the east coast protective levee to one to two miles south of the S-8 Pump Station to maintain flood discharge capability. Water supply deliveries previously made through the Miami Canal will be delivered through the North New River Canal and improved U.S. 27 Borrow Canal.
- Remove the L-68A Levee (this feature is outside SFWMM model detail).
- Degrade the L-67C Levee and backfill the adjacent borrow canal.
- Backfill the L-67A Canal from Tamiami Trail approximately 7.5 miles north.
- Relocate a single S-349 structure at the downstream end of the L-67A Borrow Canal (upstream of the S-345 structures).
- Remove the L-29 Levee and Borrow Canal (south of WCA-3A and WCA-3B) to restore sheetflow into Everglades National Park.
- Remove the L-28 and the L-28 Tieback levee and borrow canals and from the L-28 Tieback Canal south to the L-29 Canal.
- Elevate Tamiami Trail (U.S. 41) through the installation of a series of bridges between the L-31N and L-28 canals, consistent with conveyance capacities determined at I-75 and any increases required due to inflows downstream of I-75 and upstream of Tamiami Trail.
- Remove the S-344, S-343A, S-343B, and S-12 structures.
- Construct eight passive weir structures along the entire length of the L-67A Borrow Canal to promote sheetflow during high flow conditions and locate the S-345 structures just downstream of the new termination of the L-67A Canal.

Operational Changes

- Operate the WCA-2A import trigger using only the 2A-N gage as the trigger rather than using the average of the 2A-N and 2A-17 gages.
- The time series target at 2A-N was truncated at 1.25 feet above and 0.5 feet below land surface elevation.
- The time series target at 3A-NE was truncated at 1.0 feet above and 0.5 feet below land surface elevation.
- S-345 structures operations are now based on triggers at R33C26 and the NESRS-1 and NESRS-2 gages (the 3A-4 gage is no longer used).
- S-349 Structure operations are the same as the S-345 structure's operations.

Location: Within the existing boundaries of the WCAs and Everglades National Park (**Figure C-7**)

Counties: Broward, Miami-Dade

Assumptions and related considerations:

- Hydropatterns in dry areas and may potentially increase and decrease in deep water areas.
- A trade-off exists between water levels and hydroperiods in central and south central WCA-3A and Everglades National Park.
- Additional S-345 structures are needed to ensure that significant dry season flows into WCA-3B, and ultimately Everglades National Park, can be achieved.
- Miccosukee Tribal Lands adjacent to the L-29 Canal and Tamiami Trail will not be impacted.

51. Flow to Northwest and Central Water Conservation Area 3A

Restudy Component Letter: RR

Geographic Region: Water Conservation Area 3

Purpose: To increase depths and extend hydroperiods in central WCA-3A.

Operation: The S-140 Pump Station will be relocated and flows will be distributed into central WCA-3A. The operation of the pump will be driven by target stages at the 3A-4 gage.

Design: The S-140 Pump Station will be relocated approximately eight miles south of its current location and its capacity will increase from 1,300 cfs to 2,000 cfs. A spreader system will be needed to distribute the S-140 discharge via sheetflow.

Location: Within the existing boundaries of the WCAs (**Figure C-7**)

Counties: Broward

Assumptions and related considerations:

- Hydropatterns may potentially increase in dry areas and decrease in deep water areas.
- A trade-off exists between water levels in Indicator Regions 18 and 17 in central WCA-3A.
- May require increased flows from Lake Okeechobee to achieve the desired hydropatterns in central WCA- 3A.
- A spreader mechanism is required at the point where flows will be introduced into WCA-3.

52. Divert Flows from Water Conservation Area 3 to Central Lake Belt Storage Area

Restudy Component Letter: ZZ

Geographic Region: Water Conservation Area 3 and Lower East Coast Service Area 3

Purpose: Capture excess water in WCA-3A and WCA-3B to reduce above target stages in WCA-3 and to divert water through modified structures at S-9 and S-31 to the Central Lake Belt Storage Area via the L-33 Borrow Canal.

Operation: When surface water in WCA-3B exceeds target depths by 0.10 feet it will be diverted to the Central Lake Belt Storage Area via the L-33 Canal. When surface water in WCA-3A near the S-9 Structure exceeds target depths by one foot, water will be diverted to the Central Lake Belt Storage Area via the L-33 Canal.

Design:

- 500-cfs outflow structure at 2.0 feet of head (new structure) at S-9 (WCA-3A)
- 700-cfs outflow structure (modify existing S-31 if necessary) (WCA-3B)

Location: The eastern levees of WCA-3 (**Figure C-7**)

Counties: Broward and Miami-Dade

Assumptions and related considerations:

- Prioritization of use of the Central Lake Belt Storage Area water
- Telemetry systems will be required for all operable structures and pump stations

53. Divert Flows from Central Lake Belt Storage Area to Water Conservation Area 3B

Restudy Component Letter: EEE

Geographic Region: Water Conservation Area 3 and Lower East Coast Service Area 3

Purpose: Capture excess surface water and seepage from WCA-2B, WCA-3A, and WCA-3B in the Central Lake Belt Storage Area (CLBSA) and deliver it to eastern WCA-3B during dry-outs

Operation: Deliveries will be made to maintain six-inch depths in WCA-3B if NSM hydroperiod indicates WCA-3B water levels should be at or above six inches and water is available in the CLBSA. Deliveries from CLBSA will occur through a wetland treatment cell and the L-30 Borrow Canal to a spreader swale system in the eastern areas of WCA-3B.

Design:

- 500-cfs pump from the L-30 Borrow Canal to eastern portion of WCA-3B
- Spreader swale along eastern WCA-3B to convert 500 cfs to sheetflow
- Upgrade 1,500-cfs deliveries from the CLBSA to Northeast Shark River Slough to 2,000 cfs to accommodate additional flows to WCA-3B.

Location: The discharge point from L-30 Borrow Canal to WCA-3B is at the bend in the canal and is approximately 4.5 miles south of the intersection of the L-30 Borrow Canal and the C-6 Canal (**Figure C-7**).

Counties: Miami-Dade

Assumptions and related considerations:

- Prioritization of use of Central Lake Belt Storage Area water
- Telemetry systems will be required for all operable structures and pump stations

54. G-404 Pump Station Modification

Restudy Component Letter: II

Geographic Region: Everglades Agricultural Area

Purpose: Increase the capacity of the proposed Everglades Construction Project (ECP) G-404 Pump Station to improve the hydropattern restoration in the northwest corner of WCA-3A and increase the amount of water available in the west-central region of WCA-3A to reduce dry out periods.

Operation: Pump the maximum possible treated discharge from STA-3/4 across the Miami Canal from the L-5 Borrow Canal to the L-4 Borrow Canal to the northwest corner of WCA-3A. The treated discharge will sheet flow across the northern reach of WCA-3A between the Miami Canal and the L-28 Canal and flow down the L-28 Borrow Canal through the S-140 Structure. This additional water should improve the hydropattern restoration and reduce the number of dry out periods in the central region of WCA-3A. This diversion of water from the northeast section of WCA-3A should reduce the inundation duration and extreme high water depths in this sector of the WCA.

Design: Increase the capacity from 1,000 cfs to 2,000 cfs on this proposed vertical, axial flow, low head, high capacity pump station (may be slightly resized after further hydraulic analyses)

Location: Confluence of the Miami Canal, the L-5 Borrow Canal, and the L-4 Borrow Canal north of the S-8 Pump Station (**Figure C-7**).

Counties: Palm Beach

Assumptions and related considerations:

- Land availability
- Compatibility with proposed G-404 Pump Station design
- Modifications to the L-4 and L-5 borrow canals, if needed, to increase the conveyance capacities to handle the additional conveyance
- Preliminary analyses indicate the pump intake elevation for G-404 and S-8 should be about 8.0 ft NGVD to facilitate water supply deliveries west through G-404 and south through S-8.

BAYS

55. Biscayne Bay Coastal Wetlands

Restudy Component Letter: FF

Geographic Region: Biscayne Bay coastal canals and coastal wetlands

Purpose: To rehydrate wetlands, reduce point source discharge to Biscayne Bay, and to maintain higher stages in the C-102 and C-103 canals for urban and environmental water supply

Operation: The proposed project will replace lost overland flow and partially compensate for the reduction in ground water seepage by redistributing, through a spreader system, available surface water entering the area from regional canals. The proposed redistribution of freshwater flow across a broad front is expected to restore or enhance freshwater wetlands, tidal wetlands, and nearshore bay habitat. Sustained lower-than-seawater salinities are required in tidal wetlands and the nearshore bay to provide nursery habitat for fish and shellfish. This project is expected to create conditions that will be conducive to the reestablishment of oysters and other components of the oyster reef community. Diversion of canal discharges into coastal wetlands is expected not only to reestablish productive nursery habitat all along the shoreline but also to reduce the abrupt freshwater discharges that are physiologically stressful to fish and benthic invertebrates in the bay near canal outlets.

More detailed analyses will be required to define target freshwater flows for Biscayne Bay and the wetlands within the redistribution system. The target(s) will be based upon the quality, quantity, timing, and distribution of flows needed to provide and maintain sustainable biological communities in Biscayne Bay, Biscayne National Park, and the coastal wetlands. Additionally, potential sources of water for providing freshwater flows to Biscayne Bay will be identified and evaluated to determine their ability to provide the target flows.

The Biscayne Bay Coastal Canals component was incorporated into this component. The Biscayne Bay Coastal Canal component will maintain canal stages in the C-102 and C-103 canals with water provided from local sources. Wet season operation for the C-102 Canal between the S-21A and S-195 structures (open at 2.2 ft NGVD, close at 2.0 ft NGVD) and for the C-103 Canal between the S-20F and S-179 structures (open at 2.2 ft NGVD, close at 2.0 ft NGVD) will remain unchanged. Dry season operation of these sections of canals will both change from opening at 1.4 ft NGVD and closing at 1.2 ft NGVD to opening at 1.6 ft NGVD and closing at 1.5 ft NGVD.

Design: The feature includes pump stations, spreader swales, STAs, flowways, levees, culverts, the backfilling of canals, and the construction of 3.5 miles of connection canal.

Location: 3,600 acres from the Deering Estate at the C-100C Canal, south to the Florida Power and Light Turkey Point power plant, generally along the L31E Canal in southeast Miami-Dade County (**Figures C-9 and C-10**)

Counties: Miami-Dade

Assumptions and related considerations:

- The component Biscayne Bay Coastal Canals as modeled in D-13R and the Critical Project on the L-31E Flowway Redistribution are smaller components of the Biscayne Bay Coastal Wetlands feature.
- Local water source is tied to south Miami-Dade County water reuse (**Component 42**).
- Component simulates overland flow to Biscayne Bay. Since their effect is not measurable with current modeling technique, South Biscayne Bay Coastal Wetlands Components will be included as part of other project elements. The intent of these components is to restore overland flow and ground water seepage to Biscayne Bay while reducing the frequency of point-source discharges.

FLORIDA KEYS

56. Florida Keys Tidal Restoration

Restudy Component Letter: OPE

Geographic Region: Florida Bay

Purpose: The purpose of this feature is to restore the tidal connection that was eliminated in the early 1900s during the construction of Flagler's railroad. Restoring the circulation to areas of surface water that have been impeded and stagnant for decades will significantly improve water quality, benthic, floral, and faunal communities, larval distribution of both recreational and commercial species (i.e. spiny lobster), and the overall hydrology of Florida Bay.

Design: Bridges or culverts will be used to restore the tidal connection between Florida Bay and the Atlantic Ocean

Location: (Figure C-9)

- Tarpon Creek, just south of Mile Marker 54 on Fat Deer Key (width 150 feet)
- Unnamed creek between Fat Deer Key and Long Point Key, south of Mile Marker 56 (width 450 feet)
- Tidal connection adjacent to Little Crawl Key (width 300 feet)
- Tidal connection between Florida Bay and Atlantic Ocean at Mile Marker 57 (width 2,400 feet)

Counties: Monroe

BIG CYPRESS BASIN

57. Big Cypress/L-28 Interceptor Modifications

Restudy Component Letter: CCC

Geographic Region: Big Cypress Basin

Purpose: Alleviate overdrainage in northeastern Big Cypress and the Kissimmee Billy and Mullet Slough area and ensure that inflows meet applicable water quality standards.

Operation: Reroute water from the West and North Feeder canals to wetlands in northeastern Big Cypress. Allow flow along the south side of the West Feeder Canal at designated locations and through a new S-190 Pump Station, while maintaining flood protection on tribal lands and consistency with the Seminole Tribe of Florida's Conceptual Water Conservation System Master Plan. Establish sheetflow south of the West Feeder Canal across the native area of the Big Cypress Reservation. Establish sheetflow south of the reservation in the Big Cypress National Preserve Addition. Operate pumps for approximate equalization of flows.

Design:

- Degrade the levee on the southwest side of the L-28 Interceptor Canal below the S-190 structure
- Backfill the L-28 Interceptor Canal at a point south of the boundary between the Big Cypress Seminole Reservation and the Big Cypress National Preserve Addition
- Retain the levee on the northeast side of the L-28 Interceptor Canal through the Big Cypress Seminole Reservation
- Develop sheetflow along the south side of the West Feeder Canal through three pump stations and spreader canals; the pump station locations shall be adjacent to the discharge points from Water Resource Areas (WRA) 1, 2, and 3 of the Seminole Conceptual Water Conservation System
- Pump station at WRA 1 discharge: 250 cfs
- Pump station at WRA 2 discharge: 500 cfs
- Pump station at WRA 3 discharge: 750 cfs
- Replace the S-190 gated structure (existing capacity of 2,960 cfs) with a 1,460-cfs pump station
- North Feeder STA: 1,100 acres at a four-foot maximum depth
- Inflow pump station: 270 cfs
- Outflow structure: 100 cfs
- West Feeder STA: 800 acres at four-foot maximum depth
- Inflow pump station: 430 cfs
- Outflow structure: 150 cfs

Location: Western Basin, Big Cypress Seminole Reservation, and Big Cypress National Preserve Addition (Figures C-9 and C-11)

Counties: Hendry, Collier, and Broward

Assumptions and Related Considerations:

- Water quality treatment for runoff entering the West and North Feeder canals is provided by STAs, if necessary, to meet applicable water quality standards.
- The design shall be consistent with the Seminole Tribe's Conceptual Water Conservation System Master Plan.
- The existing flood protection shall be maintained.
- The evaluation of flow changes in the area south of the West Feeder Canal.
- S-190 shall be accomplished by assessing impacts on Seminole Tribe's passive use rights.
- Flow changes will be evaluated reflects minimal impact.
- Component construction will occur after completion of the Seminole Conceptual Water Conservation System.

58. Miccosukee Tribe Water Management Plan

Restudy Component Letter: OPE

Geographic Region: Big Cypress Basin

Purpose: Provide water storage capacity and water quality enhancement for tribal reservation waters which discharge from tribal lands and downstream into the Everglades Protection Area.

Design:

- 900-acre wetland retention/detention area
- Pump station, levees, trenches, and culverts to create the inflow and outflow facilities for the retention/detention area

Location: Miccosukee Tribe's Alligator Alley Reservation (**Figures C-4 and C-11**)

Counties: Broward and Collier

59. Seminole Tribe Big Cypress Reservation Water Conservation Plan

Restudy Component Letter: OPE

Geographic Region: Big Cypress Basin

Purpose: Improve the quality of water and runoff from phosphorus generating agricultural sources within the reservation. This comprehensive watershed management system is designed to achieve environmental restoration on the reservation, as well as in the Big Cypress Basin and the Everglades Protection Area. In addition, the project will reduce flood damage and promote water conservation.

Operation: The removal of pollutants will be achieved using natural treatment processes in pretreatment cells and water storage areas. A phosphorus level of 50 parts per billion is the goal, which is the current level to be achieved by the STAs of the Everglades Construction Project.

Design: This feature includes construction of water control, management, and treatment facilities in the central, western, and eastern portion of the Big Cypress Reservation. The construction elements include conveyance systems, including major canal bypass structures, irrigation storage cells, and water resource areas. It is estimated that 3,800 acres will be required.

Location: The project is located on the Seminole Tribe Big Cypress Reservation in Hendry County, directly north of the Big Cypress Basin National Preserve and west of Water Conservation Area 3A (**Figures C-9, C-10, and C-11**)

County: Hendry

SYSTEMWIDE

60. Melaleuca Eradication Project and Other Exotic Plants

Restudy Component Letter: OPE

Geographic Region: Systemwide

Purpose: Increase the effectiveness of biological control technologies to manage melaleuca and other invasive exotic species

Operation: This feature includes 1) upgrading and retrofitting the current quarantine facility in Gainesville, and 2) large-scale rearing of approved biological control organisms for release at multiple sites within the South Florida ecosystem.

Location: South Florida

Counties: All counties

REFERENCES

USACE and SFWMD. 1999. *The Central and Southern Florida Flood Control Project Comprehensive Review Study Final Integrated Feasibility Report and Programmatic Environmental Impact Statement*. U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL, and South Florida Water Management District, West Palm Beach, FL.

